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LACIE PERFORMANCE PREDICTOR
FOC USERS MANUAL

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Prepared for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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This manual describes the procedures and data required to run the FOC version of the LACIE Performance Predictor produced under Contract NAS9-14547. NASA/JSC Contract Technical Monitor is I. D. Browne, Earth Observations Division.

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1.0 GENERAL INFORMATION

1.1 SUMMARY

The LACIE Performance Predictor (LPP) is a computer simulation of the LACIE process for predicting worldwide wheat production. The simulation provides for the introduction of various errors into the system and provides estimates based on these errors, thus allowing the user to determine the impact of selected error sources.

The FOC LPP simulates the acquisition of the sample segment data by the LANDSAT Satellite (DAPTS), the classification of the agricultural area within the sample segment (CAMS), the estimation of the wheat yield (YES), and the production estimation and aggregation (CAS).

These elements include data acquisition characteristics, environmental conditions, the classification algorithms, the LACIE aggregation and data adjustment procedures. The operational structure for simulating these elements is shown in Figure 1.1-1 and consists of seven key programs as follows:

(1) LACIE Utility Maintenance Process

(2) System Error Executive

(3) Ephemeris Generator

(4) Access Generator

(5) Acquisition Selector

(6) LACIE Error Model (LEM)

(7) Post Processor

Input data is processed by two programs--the LACIE Utility Maintenance Processor and the System Error Executive. These programs process the input data, perform data compatibility checks, and form the basic data files for the LPP.

The DAPTS simulation is performed by three programs--the Ephemeris Generator, the Access Generator, and the Acquisition Selector which perform the data acquisition and selection functions.

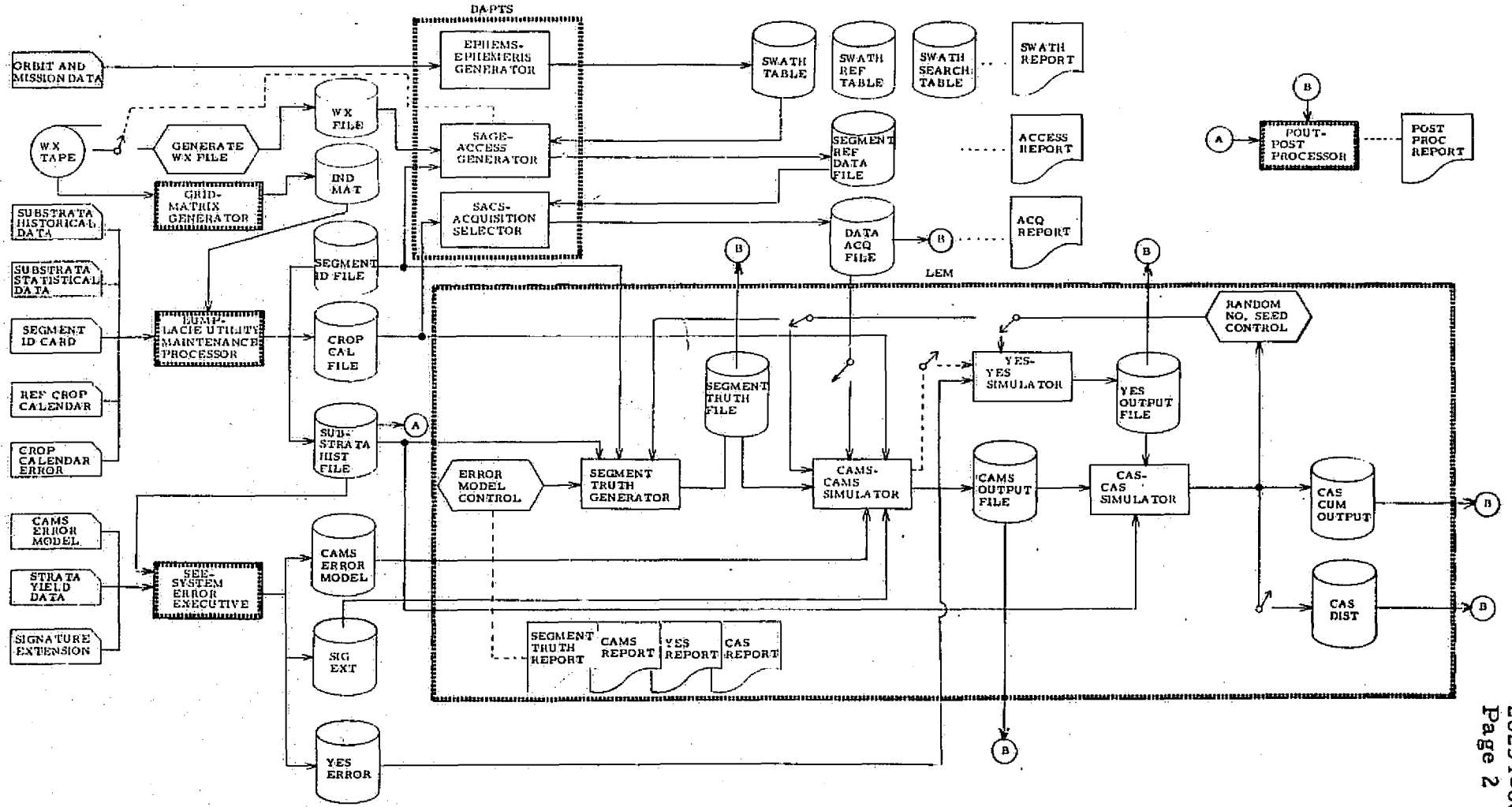


Figure 1.1-1. FOC LACIE Performance Predictor

The LACIE Error Model (LEM) performs the prime analysis task and is a single program that contains CAMS, YES, CAS, and the Segment Truth Generator. This phase contains the Monte Carlo control and allows a number of operating modes. Each module within this phase can be Monte Carlo'ed separately without changing the others and the results aggregated in CAS. Modules may also be combined for Monte Carlo runs. The CAMS Simulator may be run with or without the segment acquisition statistics to give the sampling error effects with or without acquisition constraints. The CAS Simulator accumulates the results of the repetitive Monte Carlo trials and output the statistics.

The post processor is a program that interfaces with several output files. It has the capability to output special reports from its library of reports to assist the user in post run analysis.

1.2 ENVIRONMENT

This program is designed to run on the UNIVAC 1110 utilizing the EXEC VIII operating system as installed at NASA, Houston, Texas. The program has been coded entirely in FORTRAN V. The only special features utilized are the NTRAN package and the define file capability for direct access I/O. Most of the programs will utilize core storage of 24K or under. The only exceptions to this are LUMP which uses 26K, and LEM which uses about 48K. The most disk and drum files required at any time (not card and printed output) is 15 as utilized in the LEM program. The most file space required at one time (worst case is LEM assuming 4000 segments) is 4,500,000 words. Only one 7-track tape unit is required for SAGE, on option, and for GRID. The largest disk file is the TACQ intermediate LEM work file with 2,040,000 words (assuming 2000 training segments).

It is assumed that the users of this program know how to unload and load disk files to and from save tapes since most of the files are too large to be cataloged. The EXEC VIII job control cards for running each program on the UNIVAC 1110 will have to be designed and prepared.

Each program processes one country at a time so that each country must be handled as a separate case. A four digit case number is provided to identify all data files and output reports. A system of case number identification is required to uniquely identify a study, country and program user.

It is assumed that all production usage of the programs will be performed in the batch mode even though some of the programs are small enough to be run from a terminal.

2.0 APPLICATION DESCRIPTION

2.1 LIST OF ALL PROGRAMS

2.1.1 EPHEMS

This program will compute orbital parameters for up to two vehicles orbiting about the earth for up to 549 days. This data is stored on disk files and represents a continuous swath path about the earth.

2.1.2 GRID

This program reads the NASA global weather tape. It processes the latitude and longitude in order to compute an associated grid row and column number representing a stereographic projection. It then writes the associated index number from tape into the grid matrix.

2.1.3 LUMP

This program processes substrata statistical and historical data cards, segment ID data cards and crop calendar data cards in order to generate the basic data files, CROPW, SUBHST and SEGID, for use by other programs. The various data fields are checked for valid entries. The identification for each card set is checked for compatibility with each other. If there are any errors, an error report is produced.

2.1.4 SEE

This program processes three input card sets to produce the three data files, YESERR, CAMERR and SIGEXT for use by the LEM program. Each data field is checked for validity and the ID of each card set is checked against the substrata historical file to detect missing data and incompatibility. If there are any errors, an error report is produced.

2.1.5 SAGE

Given the swath table and the segment ID file, this program determines how many times and under what conditions each segment is accessed by the satellites. The program generates the segment reference file, SEGREF. On option, a utility function can be performed to generate the weather data file, WEATHR, from the NASA weather tape.

2.1.6 SACS

This program reads the segment reference and input control data file and processes each segment using the crop window file to determine which accesses are legal. It lists all valid access for a segment and writes this information out on the acquisition file, ACQUIS.

2.1.7 LEM

LEM is an executive program which controls the operation of several application subprograms. Through these subprograms it simulates sample segment classification, strata yield estimation and production aggregation. LEM controls repetitive Monte Carlo trials based on input error distributions to obtain statistical estimates of the wheat area, yield and production at different levels of aggregation. The subprograms under its control are segment truth generator, CAMS, YES and CAS.

2.1.7.1 Segment Truth Generator

This subprogram generates the true proportion of wheat and the true proportion of mixed pixels for each sample segment from the substrata historical file and segment ID file.

2.1.7.2 CAMS

This subprogram provides an estimate of the proportion of wheat in each segment selected by the SACS program. Up to twenty-five estimates are allowed for training segments and one estimate for ordinary segments in each of four crop windows. Four types of error are accounted for in obtaining the estimates. CAMS gives a Monte Carlo simulation of three types of errors:

1. Crop Calendar Errors
2. Signature Extension Errors
3. Classification Errors

A fourth item considered is multi-temporal sampling effects.

2.1.7.3 YES

This subprogram simulates the yield estimation process of the LACIE system. It generates the yield estimates at the strata level of

from one to six estimation points in a simulation season. The estimates are computed from the true yield given in the input data, taking into account the effects of various estimation errors.

2.1.7.4 CAS

This subprogram models the LACIE aggregation technique including the aggregation of wheat area and production from the strata to the country level and the estimation of the accuracy of the aggregation. The aggregation is performed at various prediction intervals during the growing season. It also compares estimates to the truth baseline to compute actual errors.

2.1.8 POUT

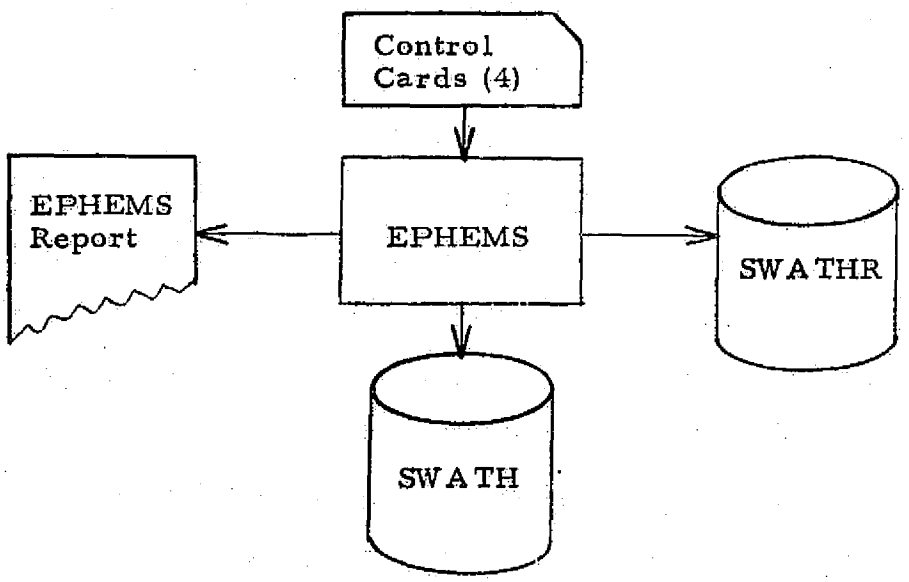
This program is an output report generator. Upon direction from the user via input control cards, the following four types of reports are produced.

1. Substrata Reference Data Report
2. Population, Standard Deviation and Histogram Reports
3. Histograms of Monte Carlo Statistics Reports
4. Frequency of Sample Segment Acquisitions Report

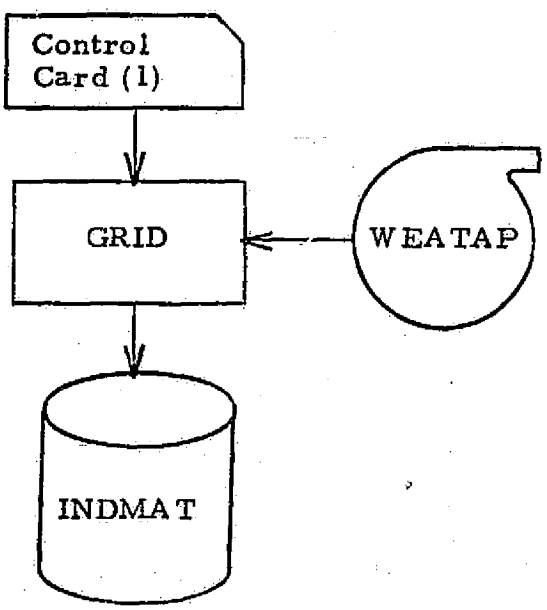
2.2 PROGRAM EXECUTION BLOCK DIAGRAMS

The following block diagrams are given for one program at a time and in the basic order of execution. File names and program names will be used. See Section 2.4 and 2.1 respectively for explanations.

2.2.1 EPHEMS

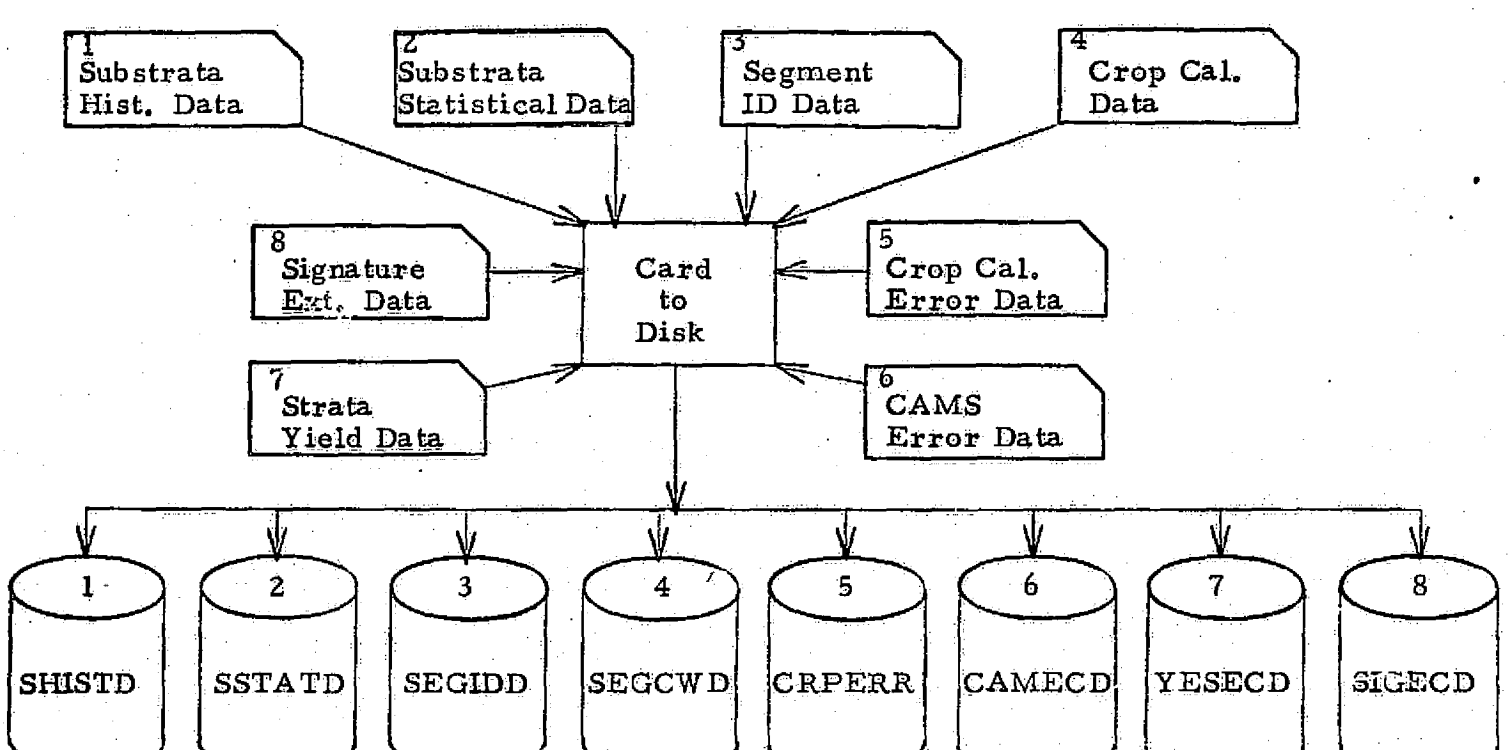


2.2.2 GRID



2.2.3 Card to Disk Utility

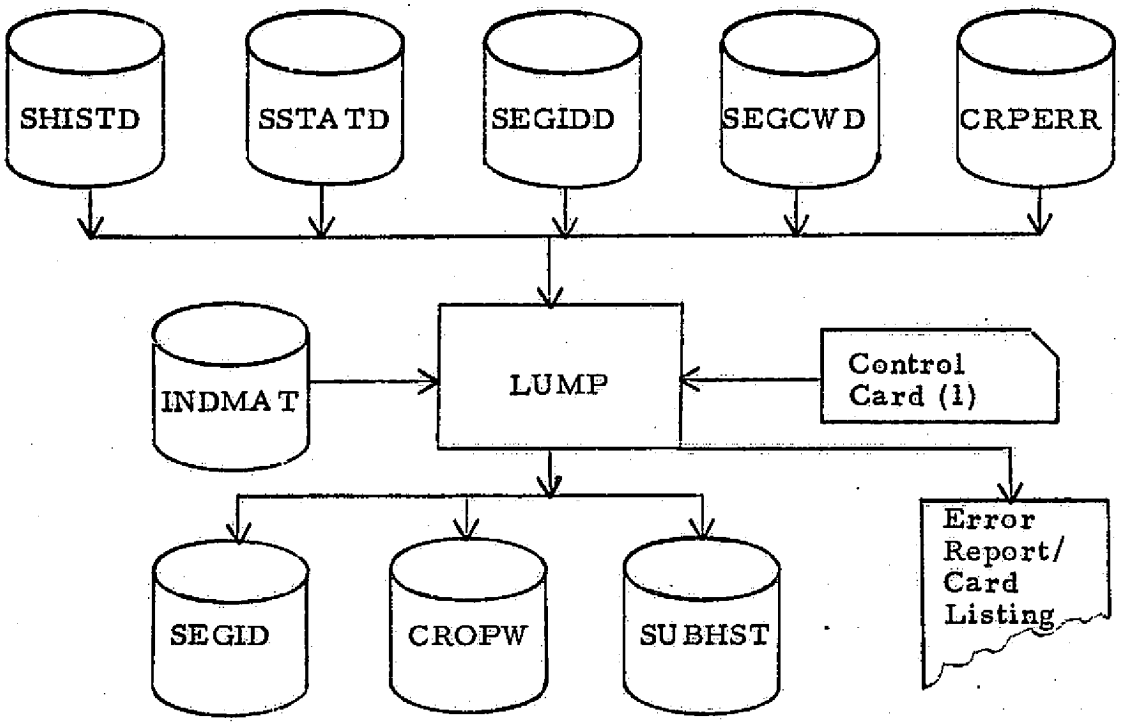
This can be a system utility or any routine which can copy card images to disk as formated 80 character records.



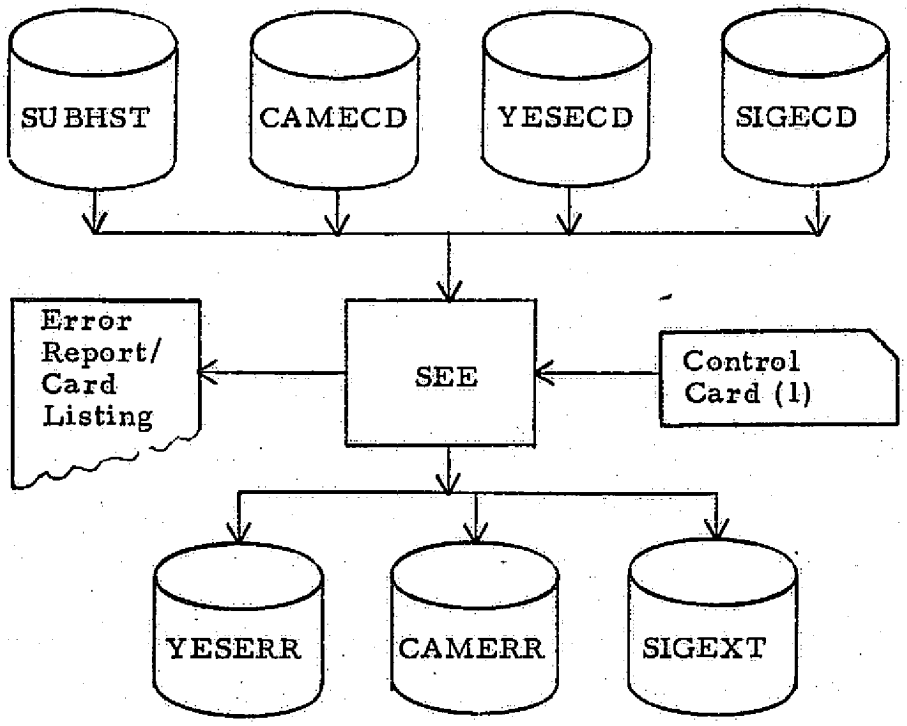
Card sets 1 through 5 must be terminated with a 'ZZZZ' in C. C. 6-9 of the last card.

Card sets 6-8 must be terminated with a 'ZZZZ' in C. C. 5-8 of the last card.

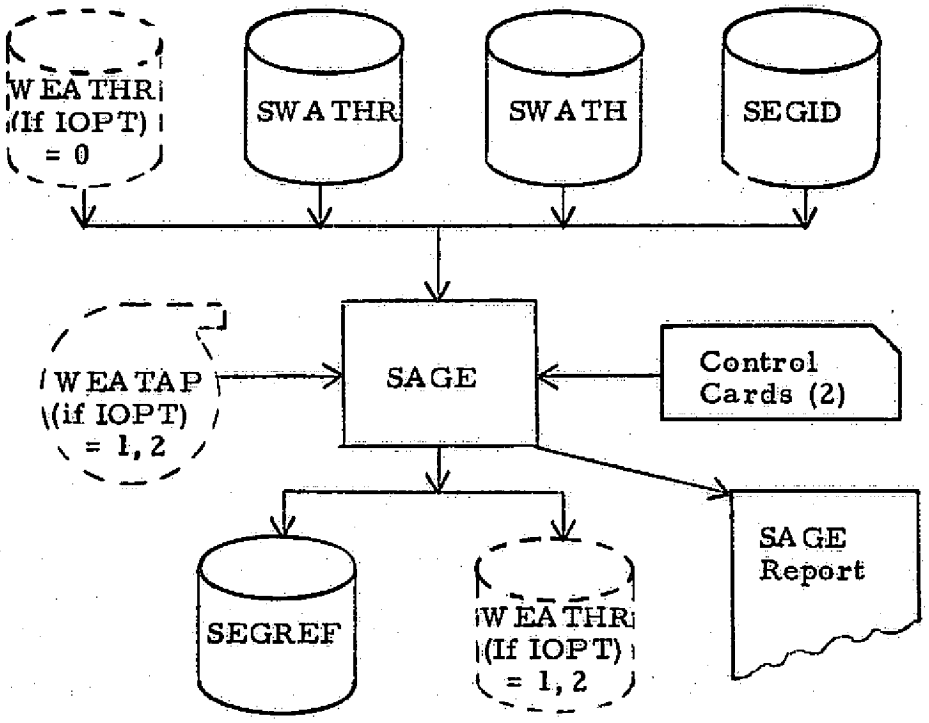
2.2.4 LUMP



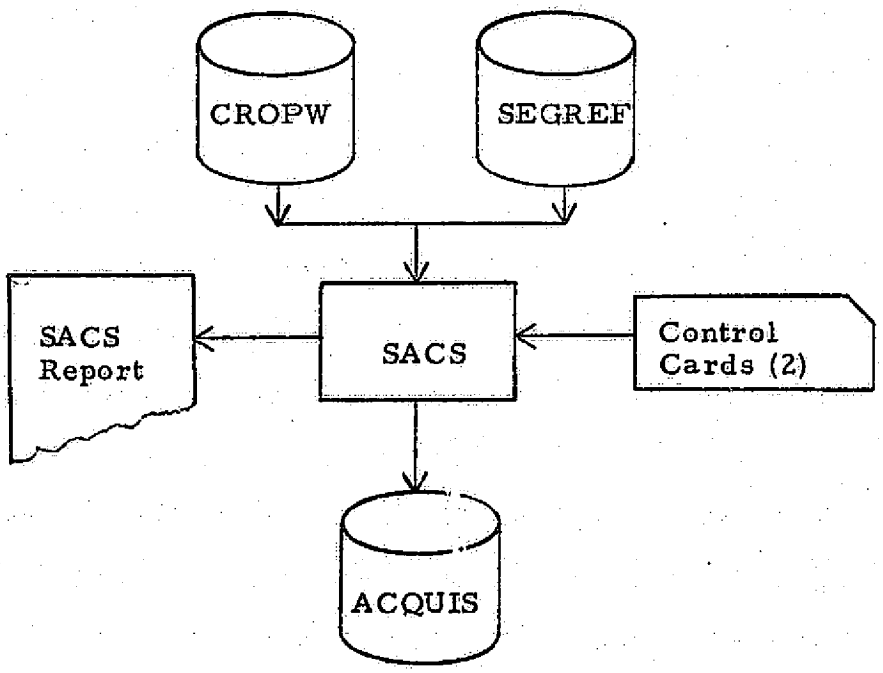
2.2.5 SEE



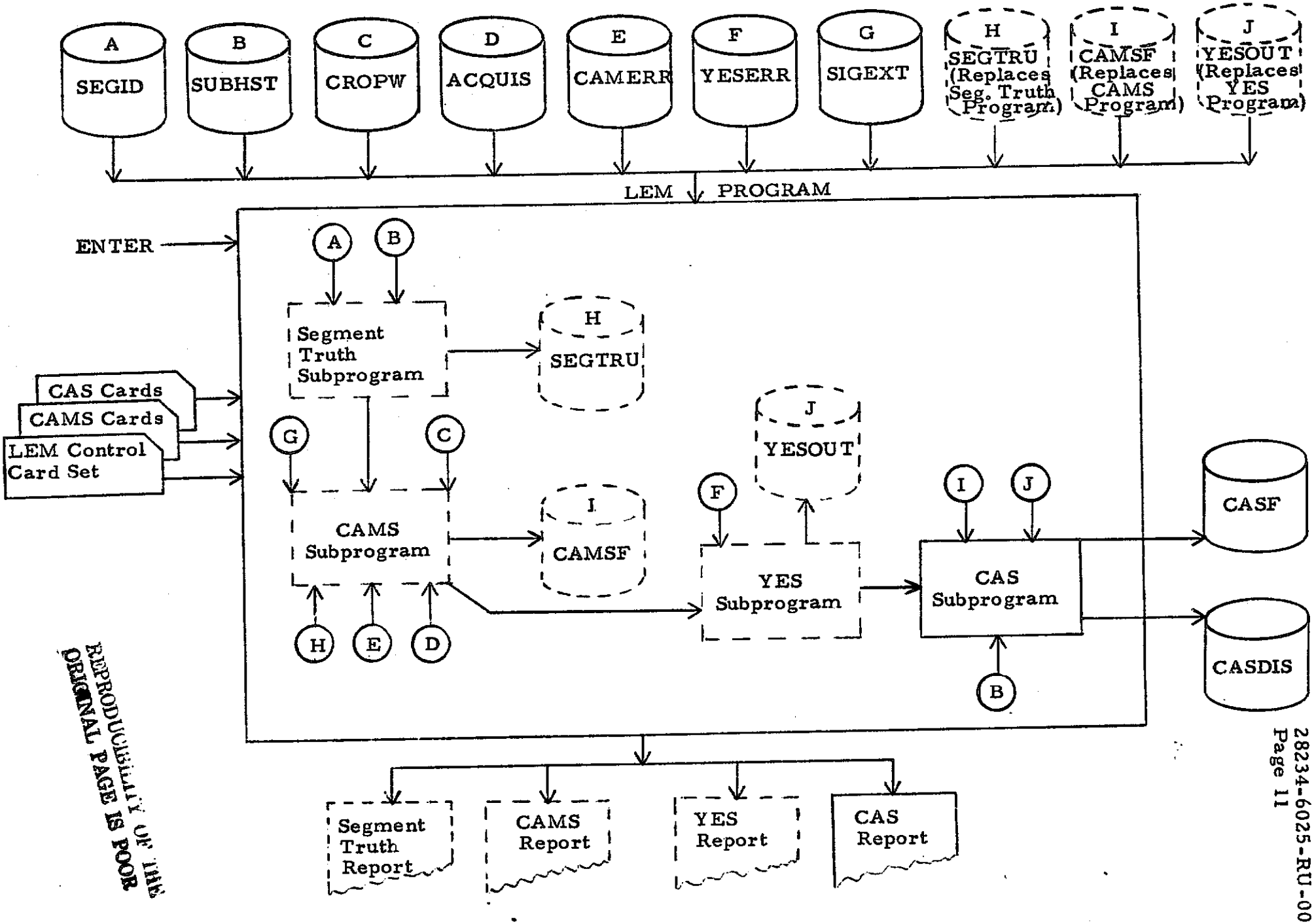
2.2.6 SAGE



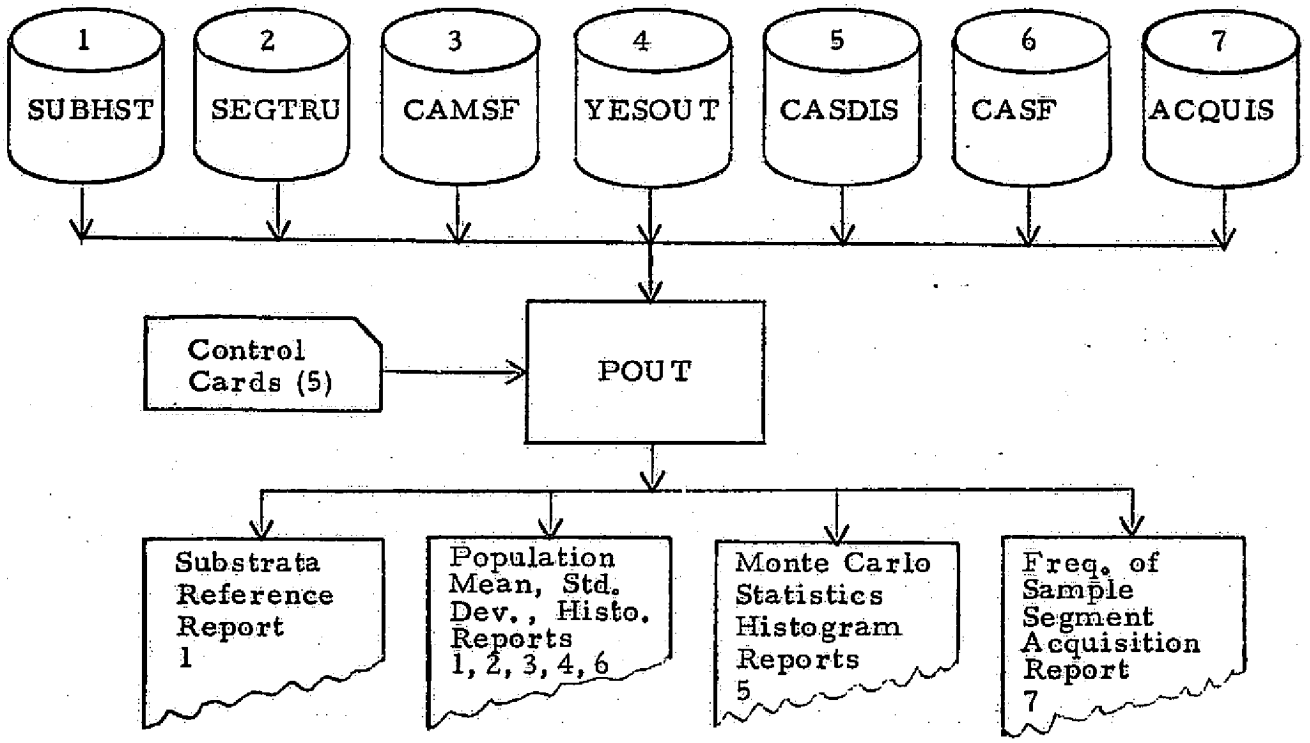
2.2.7 SACS



2.2.8 LEM



2.2.9 POUT



2.3 PERFORMANCE

The processing times and core usage given below for each LACIE program are for a UNIVAC 1108 with an EXEC II operating system. The runs used to obtain the data are from the handoff case which is part of the delivery package. Some of the basic sizing parameters are as follows:

- 1 Region
- 3 Zones
- 14 Strata
- 73 Substrata
- 65 Segments
- 50 Weather grid points
- 40 Day swath with one vehicle used for acquisitions (two vehicles for swath generation)
- 6 Prediction dates (including four bio-windows)
- 4 Monte Carlo iterations

2.3.1 EPHEMS

Time: 2 min. 32 seconds
Core: 24059_{10} words

2.3.2 GRID

Time: 7 seconds
Core: 11763_{10} words

2.3.3 LUMP

Time: 25 seconds
Core: 26257_{10} words

2.3.4 SEE

Time: 10 seconds
Core: 14439_{10} words

2.3.5 SAGE

Creation of weather file time: 11 seconds

Regular run time: 1 min. 44 seconds

Core: 21758 words

2.3.6 SACS

Time: 9 seconds

Core: 12625 words

2.3.7 LEM

Time: 5 min. 40 seconds

Core: 43867 words

2.3.8 POUT

Core: 23308 words

For RPTYPE = 1, Substrata Reference Report
CPU time - 11 sec.

For RPTYPE = 2, Yield and Production Reports
CPU time - 28 sec.

For RPTYPE = 3, Monte Carlo Reports
CPU time - 6 sec.

For RPTYPE = 4, Acquisition Data Report
CPU time - 9 sec.

2.4 DATA BASE DESCRIPTION

All files used by LACIE programs and providing interface with the user or other programs are listed in Figure 2.4-1. This figure is followed by a detailed description of each binary file providing interface between programs.

Name	Univac No.	Description	Input Case Name	Source	Destination
SWATH	8	Swath Table/Search Files	ICSESW	EPHEM	SAGE
SWATHR	9	Swath Reference File	ICSESW	EPHEM	SAGE, POUT
SEGID	1	Segment ID File	ICSESG	LUMP	SAGE, LEM
CROPW	2	Crop Window File	ICSECW	LUMP	SACS, CAMS
SUBHST	3	Substrata Historical File	ICSESH	LUMP	CAS, LEM, POUT, SEE
WEATAP	13	NASA Weather Tape - Monthly		NASA	SAGE
SEGREF	10	Segment Reference Data File	ICSESR	SAGE	SACS
WEATHR	11	Weather File/Daily	ICSEWF	SAGE	SAGE
ACQUIS	12	Data Acquisition File	ICSEAC	SACS	CAMS, POUT
CAMSF	7	CAMS Output File	ICSECO	CAMS	CAS
CAMERR	8	CAMS Error File	ICSECE	SEE	CAMS
CASF	14	CAS Cum Output File	ICSECU	CAS	POUT, CAS
YESOUT	10	YES Output File	ICSEYS	YES	CAS
SIGEXT	9	Signature Extension File	ICSESE	SEE	CAMS
YESERR	11	YES Error Model File	ICSEYM	SEE	YES
SEGTRU	13	Segment Truth File	ICSEST	LEM	CAMS
CASDIS	4	CAS Distribution Output	ICSECD	CAS	POUT
CRPERR	8	Crop Calendar Error Data Cards		CARDS	LUMP
INDMAT	4	Index Matrix Location File		GRID	LUMP
SHISTD	9	Substrata Historical Data Cards		CARDS	LUMP
SSTATD	10	Substrata Statistical Data Cards		CARDS	LUMP
SEGIDD	11	Sample Segment Location Data Cards		CARDS	LUMP
SEGCWD	12	Sample Substrata Crop Calendar Data Cards		CARDS	LUMP
YESECD	1	YES Error Data Cards		CARDS	SEE
CAMECD	4	CAMS Error Data Cards		CARDS	SEE
SIGECD	2	Signature Extension Data Cards		CARDS	SEE

Figure 2.4-1. Logical File Assignments

Name	Univac No.	Description	Input Case Name	Source	Destination
CASDSF	15	CAS Intermediate Work File		CAS	CAS
TACQ	16	CAMS Intermediate Work File for Training Segments		CAMS	CAMS
CRPINT	7	Crop Calendar Intermediate File		LUMP	LUMP
SUBINT	13	Substrata Intermediate LUMP Data		LUMP	LUMP
SEGINT	14	Segment Intermediate LUMP Data		LUMP	LUMP

Figure 2.4-1. Logical File Assignments (cont'd)

2.4.1 Swath Table - SWATH

Vehicle orbital data is stored for one orbit per day around the earth. The data represents a swath or path around the earth. There is data for up to 2 vehicles and for 549 days. There is also a record for each vehicle which contains the minimum and maximum Δlongitude.

Access Method: Direct, fixed length records uses FORTRAN V direct access routines

Status: Permanent

Sort: Vehicle number, then day

A detail number is computed by the equation:

Rec. No. = (NODAY + 1) * (VEH NO - 1) + DAYNO + 1

A trailer Rec. No. is computed by:

Rec. No. = (NODAY + 1) * (VEH NO - 1) + NODAY + 2

Media: Disk - FASTRAND

Record Formats:

Header Record

NAME(2)	-	8 bytes, file name = SWATH TB	
ICASE	-	2 bytes	
IVEH	-	2 bytes	
NODAY	-	2 bytes	
NLAT	-	2 bytes - No. of latitudes; max. of 100 in a Record	
INLAT(2)	-	4 bytes	
ISLAT(2)	-	4 bytes	
IV1TIM(1)	-	2 bytes - Year	Start date Vehicle 1
IV1TIM(2)	-	2 bytes - Month	
IV1TIM(3)	-	2 bytes - Day	
IV2TIM(1)	-	2 bytes - Year	Start date Vehicle 2
IV2TIM(2)	-	2 bytes - Month	
IV2TIM(3)	-	2 bytes - Day	
ISOSTR	-	2 bytes	
Total	-	38 bytes or 17 words + 2762 bytes filler	

Detail Record

Each item is stored as an array for all its latitudes:

LATNC - Latitude No. in deg, 2 bytes, range is 0 to ±65; + - Northern Hemisphere
- - Southern Hemisphere

LALT - Vehicle alt. from ALT, 2 bytes, KILOM*10, range is 1000-15000

TIME(2) - Vehicle time in sec, 4 bytes, range is 0-86,400

DLONG(2) - Vehicle Δ longitude in radians, 4 bytes, range is 0 to 2π

TIME(1) and (3) - Swath latitude crossing time extremes, 4 bytes each

DLONG(1) and (3) - Swath latitude crossing longitude extremes, 4 bytes each

The data for TIME, then DLONG, is the order of storage.

Total Maximum Length = 100*28 = 2800 bytes or 800 words.

Trailor Record

Contains data for all latitudes; for one latitude:

LATNO - See above.

DLONMN - Minimum Δ longitude, 4 bytes, radians, range is 0-2π

DLONMX - Maximum Δ longitude, 4 bytes, radians, range is 0-2π

Filler - 1800 bytes

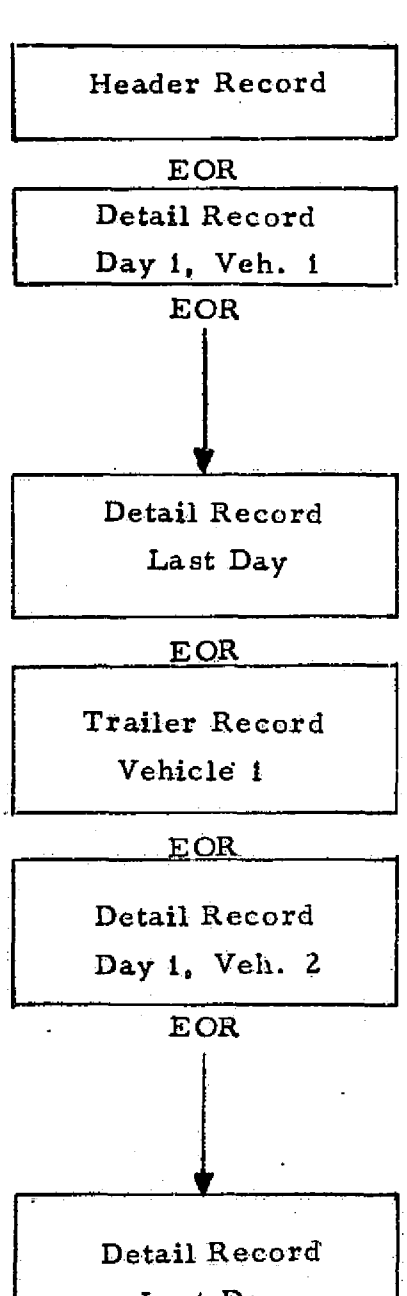
Block Factor: 1

File Size: 878,405 words for 2 vehicles and 549 days

Usage: This table is used by the segment access generator to determine and record for a given segment each access through a given period of time. "SAGE" will be given 1 start date which must be ≥ the date in the Header Record. The LATNO entry along with ISLAT

and INLAT are used to determine if a segment is in or at any latitudes in the band of latitudes on the file. ISOSTR is used to stagger the southern latitude band with respect to the northern latitude band. This table is used in conjunction with the swath reference table.

Form of Swath Table



2.4.2 Swath Reference File - SWATHR

Contains nodal data for each rev, day and vehicle. This data forms part of the swath table and is used in conjunction with it.

Access Method: Sequential, 1099 fixed length records on a FASTRAND file
Status: Permanent
Sort: Vehicle number, day
Media: Disk FASTRAND

Record Format

Header Record

NAME(2)	- 8 bytes, file name = SWATH RE			
ICASE	- 2 bytes			
IVEH	- 2 bytes			
NODAY	- 2 bytes			
IV1TIM(1)	- 2 bytes	-	Year	for Vehicle 1
IV1TIM(2)	- 2 bytes	-	Month	
IV1TIM(3)	- 2 bytes	-	Day	
IV2TIM(1)	- 2 bytes	-	Year	for Vehicle 2
IV2TIM(2)	- 2 bytes	-	Month	
IV2TIM(3)	- 2 bytes	-	Day	

CARUS(1, 1, i)	- a-semi-major axis, 8 bytes, earth radii, range is 1 to 2; for $1 \leq i \leq 2$ (veh)
CARUS(2, 1, i)	- e-eccentricity, 8 bytes, range is .00001 to .15; for $1 \leq i \leq 2$ (veh)
CARUS(3, 1, i)	- i-inclination, 8 bytes, radians, range is 1 to 2π; for $1 \leq i \leq 2$ (veh)
XOMEGD(i)	- $\dot{\Omega}$, 8 bytes, radians/sec; for $1 \leq i \leq 2$ (veh)
XWD(i)	- $\dot{\omega}$, 8 bytes, radians/sec; for $1 \leq i \leq 2$ (veh)
SA(3)	- See input definition for card data
Total	- 24 words + 31 filler

Detail Record: For 17 revolutions:

KVEH - Current vehicle number, 2 bytes, range is 1 to 2

KDAY - Current day number, 2 bytes, range is 1 to 549

WP(1, -,) - ω - argument of perigee, 4 bytes, radians, range is 0-2π

NREV - Number of revolutions, 2 bytes, range is 1 to 17

TMNODE(1)-(17) - Time ascending node crosses equator for this rev. In seconds, 4 bytes, range is 0 to 86, 400

CARUS(4, 1, -) - Longitude of ascending node for this rev. In radians, 4 bytes, range is 0 to 2π

17

Ground Station Indicators - 2 bytes, use undefined for DAPTS, 17 entries

Record Length: 55 words

Recommended Block Factor: 4

File Size: 197, 820 bytes or 60, 445 words

Usage: This file is used in conjunction with the swath table by SAGE to determine when and if a segment is accessed. The swath reference file is searched for a day and rev entry within a supplied delta of a given nodal logitude and time. The day obtained in this manner is used to read the desired record from the swath table. The calculations on the data can then be performed to obtain a further check for access.

2.4.3 Segment ID File - SEGID

This file is generated from NASA data cards for use in the SAGE and LEM program. It is generated in the LUMP program.

Access Method: Sequential with fixed length records.

Status: Semi-permanent. Changed only when the segment data base is changed.

Sort: Country, then region, then zone, then strata, then substrata, then segment, 4000 records.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'SEGMENT', 4 char./word

ICASE - Case no.

ITSFG - 1 word integer = 0 all segments are training segments
≠ 0 both ordinary and training segments present

13 word filler

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 2 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 1 word integer, 3 digit no., 1 to 500

Substrata - 1 word integer, 1 to 3200

Segment ID - 1 word integer, 4 digit no., 1 to 4000

Training Seg Ind - 1 word integer, 1 - normal, 0 - training

Training Segment Priority List - 6 words, each entry is the segment no. of a training segment. The segments are listed highest priority first. Less than 6 entries terminated by a 0.

Latitude - 1 word flt. pt., in radians, $\pm\pi/2$

Longitude - 1 word flt. pt., in radians, $0-2\pi$

Grid No. - 1 word integer, 1-16000

Spring/Winter Flag - 1 word integer, 0 for winter, 1 for spring

Total: 17 words

Last detail record has 'ZZZZ' in the first 4 bytes followed by 0's in the remainder of the record.

Recommended Block Factor: 20

File Size: 68,034 words

Usage: Used by SAGE to get Lat/Lon and grid no. Used by LEM to place Lat/Lon on segment truth file.

2.4.4 Crop Calendar File - CROPW

This file obtained from NASA data cards and is rewritten on a disk file for convenient processing by the LUMP program. It contains the crop window start-stop dates for 4 crop growing windows.

Access Method: Sequential with fixed length records.

Status: Updated very infrequently.

Sort: Country, then region, then zone, then strata and then substrata. There are a maximum of 3200 substrata records.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'CROPWIND', 4 char./word

ICASE - 1 word integer, 4 digit number

IWIN - 1 word integer, no. of crop windows = 4

Total - 4 words + 29 words filler

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 2 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 1 word integer, 3 digit no., 1 to 500

Substrata ID - 1 word integer, 4 digit no., 1 to 3200

Data for Winter Wheat

4 sets of 2 items - 1 set for each window

Predicted Start Date - 1 word integer, Zulu date - no. of days since 1950

Predicted End Date - 1 word integer, Zulu date - no. of days since 1950

Std Deviation of Seg. Calendar Error - 1 word integer in days Range: $0 \rightarrow \pm 99$

Crop Window Error - 5-1 word integers, Δ no. of days in error. The 1st entry is for 1st window start. The 2nd-4th entries are for end of i-1 window and start of ith window ($2 \leq i \leq 4$). The last entry is for the 4th window end date. Range: $0 \rightarrow \pm 99$

Data for Spring Wheat

Repeat of same type of data as for winter wheat

Total: 33 words

Trailer Record: Has 'ZZZZ' in the first 4 bytes followed by 0's.

Recommended Block Factor: 10

File Size: 105,666 words

Usage: This file is used by SACS in conjunction with the segment reference data file to determine if an access has occurred. It is also used by CAMS to determine crop calendar errors. If the first entry of a spring or winter start date is 0, then that data set is missing.

2.4.5 Substrata Historical File - SUBHST

This file is generated in the LUMP program from the substrata historical card data supplemented by intermediate calculations. It is used in the CAS analysis program. Data for one country will be stored.

Access Method: Sequential with fixed length records.

Status: Permanent, off loaded on tape.

Sort: Country, then region, then zone, then strata, and then substrata. A maximum of 3200 substrata data records.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name 1 'SUB HIST', 4 char. /word
ICASE - 1 word integer, case or ID no., 4 digits
IMXSEG - 1 word integer, maximum no. of segments in any substrata - 1 to 150
Total Length: (4 + IMXSEG + 14) words

Detail Record - for each substrata:

Country ID - 4 bytes, 4 alpha characters
Region ID - 1 word integer, 2 digit no., 1 to 10
Zone ID - 1 word integer, 3 digit no., 1 to 100
Strata ID - 1 word integer, 3 digit no., 1 to 500
Substrata ID - 1 word integer, 4 digit no., 1 to 3200
NSEG - No. of sample segments in this substrata 1 to 150
IDSEG(IMXSEG) - List of sample segments in this substrata, each entry is a 4 digit integer.
Group No. - 1 word integer
1 - One or more sample segments in substrata
2 - Associated with 1 or more sample segments in the strata
3 - No sample segments in substrata or associated with the strata.
$\tilde{PW}$ - Historical proportion of wheat, flt. pt. in %

Land Area - Flt. pt., land area of the substrata in kilometers^2

PW_k - True proportion of wheat in %, flt. pt.

N_{AGR} - 1 word integer, no. of agricultural segments in the substrata

N_A - 1 word integer, no. of allocated segments in the substrata

δPW - Flt. pt., bias of true proportion of wheat

δPM - Flt. pt., ratio of true mixed pixels

CV1 - Flt. pt., coefficient of variation for year-to-year change in PW

CV2 - Flt. pt., coefficient of variation for within county variation of PW

CV3 - Flt. pt., coefficient of variation for within county variation of proportion of mixed pixels

CV4 - Flt. pt., coefficient of variation of multi-year historical wheat area

Total Record Length - Max is for USSR, 168 words

Trailer Record Length: Has 'ZZZZ' in the first 4 bytes followed by 0's.

Recommended Block Factor: 4

File Size: Maximum 537,936 words

2.4.6 NASA Weather Tape Format - WEATAP

There is one file on tape written in binary mode (odd parity) with sequential I/O routines. The tape is 7 track written at 800 BPI density. There will be 1600 physical records on tape and each record will be 500 words long. There will be 10 logical index point records per physical record. Each logical record will be 50 words long and will contain BDC information in the following format:

INDEX	⊢GRID⊣		LAT	N or S	|LONG|		E or W	YEARS	% FREC	MEAN%
(I5, 2X,	I3, 2X, I3,	3X,	3I2,	A1,	1X, I3, 2I2,		A1,	I2,	I2, (I3, 8I2),	12I3)

2.4.7 Segment Reference File - SEGREF

This file is generated by SAGE to provide a reference data base for all segments to be analyzed by the SACS program. This file can represent a maximum of up to a 426 day time period.

Access Method: Sequential with fixed length records.

Status: Semi-permanent. Regenerated normally less than once per week. Will normally be kept on tape.

Sort: Country, then region, then zone, then strata, then substrata, and then segment. There are a maximum of 4000 segments.

Media: Tape

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'SEG REFE', 4 char. /word

ICASE - 1 word integer, case no., 4 digits

Reference Date - No. of days since 1950 (2 bytes). Used in conjunction with acquisition date.

NMAX - 1 word integer, no. of days in study; range 1 to 426

Dummy Word

ICSESW - 1 word integer, swath files case no. - 4 digits

ICSESG - 1 word integer, segment ID file case no., 4 digits

NVEH - No. of vehicles - 1 word integer

Total: 9 words + 599 word filler

Detail Record:

Country ID - 1 word, 4 alpha characters

Region ID - 1 word integer, 2 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 1 word integer, 3 digit no., 1 to 500

Substrata ID - 1 word integer, 4 digit no., 1 to 3200

Segment ID - 1 word integer, 4 digit no., 1 to 4000

Training Seg. Ind. - 1 word integer, 1 - normal, 0 - training

Spring/Winter Flag - 1 word integer, 0 for winter, 1 for spring

Acquisition Data Set - Repeated 75 times x NVEH

Acquisition Day - 1 word integer, Zulu date (no. of days since 1950)

Sun Elevation Angle - 1 word flt. pt., radians, range $\pm 90^{\circ}$

Cloud Cover % - 1 word integer, % * 10

Time of Acquisition - 1 word flt. pt., sec, 1 to 86,400

Total Length: 608 words

Last detail record has 'ZZZZ' in the first word followed by 0's in the remainder of the record.

Block Factor: 2

File Size: 2,432,008 words for 2 vehicles

2.4.8 Weather Data File - WEATHR

This file contains cloud cover % for 366 days and 16000 grid points. This file is generated from a NASA supplied weather tape.

Access Method: Direct with fixed length records - uses FORTRAN V direct access routines

Status: Semi-permanent. Can be regenerated for each use of SAGE or kept as a permanent file for IOC studies.

Sort: Grid point, then day

To get to a particular record N which represents 5 grid points:

$$N = 1 + \frac{GRID}{5} + 1 \text{ (if remainder)}$$
$$+ 0 \text{ (if no remainder)}$$

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 bytes, file name = 'WEATHER'

NMAX - No. of days in a record, 2 bytes, 1 to 366

Total: 12 bytes or 4 words

171 byte filler

Detail Record - For 1 grid - all days

Each day entry is a value 0 to 8 representing 8th's of 100%. 8-4 bit entries are stored right justified in a word; for 366 days it would require $\frac{366*4}{8}$ = 183 bytes or 46 words.

Blocking Factors: 5 (Internal)

File Size: 2,928,000 bytes, 736,000 words

Usage: This file is used by SAGE to obtain the cloud cover data.

2.4.9 Data Acquisition File - ACQUIS

This file contains a list of accesses for each segment processed in the segment acquisition selector program (SACS). It is to be generated using the Crop Window File and Segment Reference Data File. A maximum 426 day time period is represented.

Access Method: Sequential with fixed length records.

Status: Regenerated - either from rerunning SACS or loading from a saved tape.

Sort: Country, then region, then zone, then strata, then substrata, and then segment. A maximum of 4000 records for one country.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'ACQUISI', 1 char./word

ICASE - 1 word integer, 4 digit case no.

NMAX - 1 word integer, no. of days in study; range = 1-426

IWIN - 1 word integer, no. of crop windows used in study ≡ 4

HEAD(4, 4) - 4, 4 word entries, each entry consists of a 16 character crop window title

ICCAS - 1 word integer, crop window case number

ISCAS - 1 word integer, seg refer case number

IFILL(84) - 84 words of filler

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 3 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 1 word integer, 4 digit no., 1 to 500

Substrata ID - 1 word integer, 4 digit no., 1 to 3200

Segment ID - 1 word integer, 5 digit no., 1 to 4000

For each of 4 Crop Windows:

25 entries for

Acquisition Date - 1 word integer, Zulu date

Total No. of Accesses - 1 word integer, 3 digit no.

Total Length: 107 words

Dummy data record with country = 'ZZZZ' trails last data record.

Recommended Block Factor: 5

File Size: IOC - 428,214 words

Usage: This file will be used by the CAMS module within the acquisition and analysis program. It is used to obtain the acquisition list by Crop Window for each segment in the study.

2.4.10 CAMS Output File Description - CAMSF

This file is used by the CAS program and is generated by CAMS.

Record Formats:

Header Record:

- Name - 8 char., 3 alpha, file name - 'CAMS OUT', 4 char./word
- Case Number - 1 word integer, 4 digit case number
- Error Model - 1 word integer, = 0 - Model 1, = 1 - Model 2
- CAMD Error File Case Number
- ACQUISI File Case Number
- CROPW File Case Number
- SEG TRUTH File Case Number
- Signature Extension File Case Number
- IMULTI - Multi-temporal Option Flag
- TSCC - Crop Calendar Error Option Flag
- ICLASS - Input Classification Indicator
- ISEXT - Signature Extension Flag
- IACQ - Acquisition File Usage Flag
- ICAMS - CAMS Option Flag
- Total: 4 words of filler

Detail Record (one per segment):

- Country ID - 4 bytes, alphanumeric
- Region ID - 1 word integer, 2 digit number, 1-10
- Zone ID - 1 word integer, 3 digit number, 1-100
- Stratum ID - 1 word integer, 3 digit number, 1-500
- Substratum ID - 1 word integer, 4 digit number, 1-3200
- Segment ID - 1 word integer, 4 digit number, 1-4000
- True proportion of wheat this segment, flt. pt., % 0-100
- Zulu Acquisition Day - 1 word integer (zero for no acquisition) } One ordered set for each of 4 windows
- Estimated Proportion of Wheat - Flt. pt.; % 0-100 } One ordered set for each of 4 windows
- Error in Proportion of Wheat Estimate, flt. pt.; $\pm$99.99 } One ordered set for each of 4 windows
- Total Length: 19 words

Trailer Record:

- Name - 4 bytes, 'ZZZZ'
- Total: 1 word with 18 word filler

File Size: 78,038 words - assuming 4000 segments

Access Method: Sequential binary file with fixed length records

Recommended Blocking Factor: 20

Sort: Country through segment

Media: Disk - FASTRAND

Status: Temporary, will be regenerated for each study.

2.4.11 CAMS Error File - CAMERR

This file is generated by SEE and used by the CAMS program.

Sort: Country, Region, Zone, Strata, Substrata, Segment

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name 'CAMS ERR', 4 char./word

ICASE - Case no., 1 word integer

Total: 3 words + 47 words filler

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 3 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 2 bytes, 4 digit no., 1 to 500

Substrata ID - 2 bytes, 4 digit no., 1 to 3200

Segment ID - 2 bytes, 4 digit no., 1 to 4000

Crop Window (4) - one set of data below for each crop window (see SEE Problem Description Input Data for definitions)

$P(W/W)$ - Flt. pt., 0 to 1

$P(W/M)$ - Flt. pt., 0 to 1

$P(W/O)$ - Flt. pt., 0 to 1

$B_{W/W}$ - Flt. pt., ± 9.999

$\sigma_{W/W}$ - Flt. pt., 0-9.99

$B_{W/M}$ - Flt. pt., ± 9.999

$\sigma_{W/M}$ - Flt. pt., 0-9.99

$B_{W/O}$ - Flt. pt., ± 9.999

$\sigma_{W/O}$ - Flt. pt., 0-9.99

B_{PW} - Flt. pt., ± 9.999

σ_{PW} - Flt. pt., 0-9.99

Record Length: 50 words

Last detail record has 'ZZZZ' in the first 4 bytes followed by 0's in the remainder of the record.

Block Factor: 10

File Size: 200, 100 words, assuming a maximum of 4000 segments

Usage: Used by CAMS

Status: Semi-permanent, changes only when CAMS error model changes.

2.4.12 CAS Cumulative Output File - CASF

This file is generated by the CAS module and is used by the output processor (POUT) and by LEM for restart. It contains values accumulated over all Monte Carlo iterations.

Access Method: Random access with fixed length records.

Status: Changed for each Monte Carlo iteration in LEM. The final LEM version will be kept only as needed to complete a current error model study. Required for restart of the LEM program.

Format:

Record 1 is the header record,
Record 2 is the country record,
Records 3-12 are the region records,
Records 13-62 are the zone records,
Records 63-387 are the strata records.

Header Record Format:

1. Name(1) - 6 character file name 'CASCUM'
2. ICASE - Case no., 1 word integer
3. COUNTR - Country, A6 format
4. NT - Current Monte Carlo iteration number
5. NREGS - No. of regions
6. NZTOT - Total number of zones
7. NSTRAT - Total number of strata
8. NBW - No. of bio-windows; 1-4
9. NPDATE - No. of prediction dates; 1-14

10-13. - Up to 4 bio-window numbers

14-27. PRDATE - Up to 14 prediction dates in Zulu time

477 words of filler

Total Length: 504 words

Each data record contains data blocks for up to four bio-windows and up to 14 prediction dates. The blocks for the bio-windows come first followed by the blocks for the prediction points. Missing bio-windows or prediction points are represented by zero fill.

Country Data Record Format:

This record consists of 18 blocks, each containing the 28 quantities in Data Set 17.

1. HWAC - Historical wheat area ($\tilde{WA}$)
2. TWAC - True WA
3. EWAC - Estimated $\hat{WA}$
4. AERRC - Error in WA
5. AVARC - Variance in WA
6. TPRODC - True production
7. EPRODC - Estimated production
8. PRERRC - Error in production
9. PRVARC - Variance in production
10. TYC - True yield
11. EYC - Estimated yield
12. YERRC - Error in yield
13. M1C - No. of acquired Group I segments
14. M2C - No. of acquired Group II segments
15. CT1C - No. of Group I substrata with acquired segments
16. CT2C - No. of Group II substrata with acquired segments
17. CT3C - No. of Group III substrata
18. ANAVC - Analytic area variance
19. ANPRVC - Analytic production variance
20. SQAERC - $\sum^{C}$ (area error)^2
21. SQPERC - $\sum^{C}$ (production error)^2
22. SQYERC - $\sum^{C}$ (yield error)^2
23. CLEWA - Confidence level about estimated wheat area
24. CLEPRD - Confidence level about estimated production
25. CLATEC - Confidence level about true wheat area using estimated variance
26. CLPTEC - Confidence level about true production using estimated variance
27. CLATWC - Confidence level about true wheat area using within county variance
28. CLPTWC - Confidence level about true production using within county variance

Total length: 504 words

Region Data Record Format:

This record consists of 18 blocks, each containing the 22 quantities from Data Set 16 plus identifying information.

1. REGION - Region ID
2. 0 - } 2 words of filler
3. 0 - }
4. NZONES - Number of zones in region
5. HWAR - }
6. TWAR - }
   ⋮ }
23. ANPRVR - } Similar to country quantities
24. SQAERR - }
25. SQPERR - }
26. SQYERR - }
27. 0 - } 2 words of filler
28. 0 - }

Zone Data Record Format:

This record consists of 18 blocks, each containing the 22 quantities from Data Set 15 plus identifying information.

1. REGION - Region ID
2. ZONE - Zone ID
3. 0 - Filler
4. NSTRAZ - No. of strata in zone
5. HWAZ - }
6. TWAZ - }
   ⋮ }
23. ANPRVC - } Similar to region and country quantities
24. SQAERZ - }
25. SQPERZ - }
26. SQYERZ - }
27. 0 - } 2 words of filler
28. 0 - }

Strata Data Record Format:

This record consists of 18 blocks, each containing the 22 quantities from Data Set 14 plus identifying information.

DSET14

1.	REGION - Region ID
2.	ZONE - Zone ID
3.	STRATA - Strata ID
4.	0 - Filler
1-5.	HWAS
2-6.	TWAS
3-7.	EWAS
4-8.	AERRS
5-9.	AVARS
6-10.	TPRODS
7-11.	EPRODS
8-12.	PRERRS
9-13.	PRVARS
10-14.	YS
11-15.	ESTYS
12-16.	YERRS
13-17.	M1JS
14-18.	M2JS
15-19.	CT1S
16-20.	CT2S
17-21.	CT3S
18-22.	ANAVS
19-23.	ANPRVS
20-24.	SQAERS
21-25.	SQPERS
22-26.	SQYERS
27.	0
28.	0

Recommended Blocking Factor: 1

File Size: 195,048 words

2.4.13 YES File Description - YESOUT

This file is created by YES and used by the CAS program.

Access Method: Sequential with fixed length records.

Status: Semi-permanent - changed only when YES error model changes.

Sort: Country through stratum - 500 stratas maximum

Media: Disk - FASTRAND

Header Record:

Name(2) - 8 char., file name - 'YES', 4 char./word

Case Number - 1 word integer, 4 digit case number

Total: 20 words filler

Detail Record

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 2 digit number, 1-10

Zone ID - 1 word integer, 3 digit number, 1-100

Stratum ID - 1 word integer, 3 digit number, 1-500

YSTR - True yield for stratum, flt. pt. in quintals/HECTAR

One set for each of 6 prediction points

IZPRDD - Zulu prediction date, 1 word integer

YSCI - Estimated yield for this prediction date, 1 word integer; 0-99.99 in quintals/HECTAR

VSYCI - Standard deviation of yield error, flt. pt.; 0-99.99 in quintals/HECTAR

Total: 23 words

Trailer Record:

Name(2) - 4 bytes, file ender, 'ZZZZ'

Total: 1 word with 22 word filler

Recommended Block Factor: 10

File Size: 11,546 words

2.4.14 Signature Extension File

This file is generated from cards in SEE (System Error Executive). It contains coefficients for signature extension processing in CAMS for 2 error models.

Access Method: Sequential with fixed length records.

Status: Semi-permanent. Only changed when the error model changes.

Sort: Country, then region, then zone.
50 zone records maximum.

Media: Disk - FASTRAND

Record Formats:

Header Record:
Name(2) - 8 char., file name - 'SIGEXTEN', 4 char./word
ICASE - 1 word integer, 4 digit case no.
56 words of fill

Detail Record:
Country ID - 4 bytes, 4 alpha characters
Region ID - 1 word integer, 2 digit no., 1 to 10
Zone ID - 1 word integer, 3 digit no., 1 to 100
Model 1 Data - Classification error coefficients

Coefficient set to account for probability of classifying as wheat given wheat. Same set as for Model 2 - 14 flt. pt. words.
B_{1W}, B_{2W}, σ_{1i_W}, σ_{2i_W} $(1 \leq i \leq 6)$

Coefficient set to account for probability of classifying wheat given mixed, 14 flt. pt. words.
B_{1M}, B_{2M}, σ_{1i_M}, σ_{2i_M} $(1 \leq i \leq 6)$

Coefficient set to account for probability of classifying as wheat given other, 14 flt. pt. words.
B_{1O}, B_{2O}, σ_{1i_O}, σ_{2i_O} $(1 \leq i \leq 6)$

Model 2 Data - Ignore classification errors

B_1, B_2 - 2 word flt. pt., bias coefficients

σ_{1i} $(1 \leq i \leq 6)$ - 6 word flt. pt., std. dev. multiplier coefficients for each of 6 training priority segments

σ_{2i} $(1 \leq i \leq 6)$ - 6 word flt. pt., std. dev. adder coefficients for each of 6 training priority segments

Total: 59 words

Last detail record has 'ZZZZ' in country ID field followed by 0's.

Recommended Blocking Factor: 10

File Size: 6,018 words maximum

Data Ranges:

σ's are between -9.999 and +9.999

B's are between 0 and +9.999

2.4.15 YES Error Model File

This file is generated from cards in SEE. It contains reference yield data and yield error parameters. It is used by the YES module.

Access Method: Sequential with fixed length records.

Status: Semi-permanent. Changes when new error model is required or when new yield reference data is available.

Sort: Country, then region, then zone, and then strata. A maximum of 500 strata records.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'YESERROR', 4 char./word

ICASE - 1 word integer, 4 digit case no.

20 words of 0 fill

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 2 digit no., 1-10

Zone ID - 1 word integer, 3 digit no., 1-100

Strata ID - 1 word integer, 3 digit no., 1-500

Y_{TRUE} - True yield in quintals/HECTAR, 1 word flt. pt.

Truncation Month Yield Error Data

In ascending order, a zero entry terminates

6 - 3 word sets of following data

Truncation Date in Zulu - Integer

Bias error in quintals/HECTAR - flt. pt.; $\pm$99.99

Standard Deviation - flt. pt. quintals/HECTAR; 0-99.99

Total: 23 words

Trailer Record:

Has 'ZZZZ' in country ID field followed by 0's.

Recommended Blocking Factor: 20

File Size: 11,546 words

2.4.16 Segment Truth File

This file is generated under control of the LEM processor in order to provide segment truth data for CAMS module.

Access Method: Sequential with fixed length records.

Status: Changed for each Monte Carlo iteration in LEM. The final LEM version will be kept only as needed to complete a current error model study.

Sort: Country, then region, then zone, then strata, then substrata, then segment. A maximum of 4000 records.

Media: Disk - FASTRAND

Record Formats:

Header Record:

Name(2) - 8 char., file name - 'SEGTRUTH', 4 char. /word

ICASE - Case no., 1 word integer

ITSFG - 1 word integer = 0 all segments are training segments
≠ 0 both ordinary and training segments are present

12 words filler

Detail Record:

Country ID - 4 bytes, 4 alpha characters

Region ID - 1 word integer, 2 digit no., 1 to 10

Zone ID - 1 word integer, 3 digit no., 1 to 100

Strata ID - 1 word integer, 3 digit no., 1 to 500

Substrata ID - 1 word integer, 4 digit no., 1 to 3200

Segment ID - 1 word integer, 4 digit no., 1 to 4000

Training Seg. Ind. - 1 word integer, 1 - normal, 0 - training

Training Seg. Priority List -

6 words, each entry is the segment no. of a training segment. The segments are listed highest priority first. Less than 6 entries are terminated by a 0.

Spring/Winter Flag - 1 word integer, 0 for winter, 1 for spring

True Proportion of Wheat - 1 word flt. pt., PW in % 0-100

True Proportion of Mixed - 1 word flt. pt., PM in % 0-100

Total Record Length: 16 words

Trailer Record:

Has 'ZZZZ' in country ID field followed by 0's.

Recommended Blocking Factor: 20

File Size: 64,032 words

2.4.17 CAS Distribution Output File - CASDIS

This file is generated by the CAS module and is used by the output processor (POUT). It contains certain quantities (errors and confidence levels) for each Monte Carlo iteration.

Access Method: Random access with fixed length records.

Status: Changed for each Monte Carlo iteration in LEM. The final LEM version will be kept only as needed to complete a current error model study.

Format:

Record 1 is the header record,

Records (2-4) + 63 (PN-1) are the country records (3 records are required),

Records (5-14) + 63 (PN-1) are the region records,

Records (15-64) + 63 (PN-1) are the zone records; where PN is prediction point no. $1 \leq PN \leq 18$.

There are 1 + 18 x 63 = 1135 records. Each set of 63 records after the first record belong to a prediction point.

Header Record Format:

1. Name(1) - 6 character filename 'CASDIS'
2. ICASE - Case no., 1 word integer
3. COUNTR - Country, A6 format
4. NT - Current Monte Carlo iteration number
5. NREGS - No. of regions
6. NZTOT - Total number of zones
7. FILLER
8. NBW - No. of bio-windows; 1-4
9. NPDATE - No. of prediction dates; 1-14

10-13. - Up to 4 bio-window numbers

14-27. PRDATE - Up to 14 prediction dates in Zulu time

276 words of filler

Total Length: 303 words

Format of First Country Data Record:

Word(s)		Description
1.	AEREFC	Reference value for area error
2.	PEREFC	Reference value for production error
3.	YEREFC	Reference value for yield error
4-103.	AERRC	Word n+3 specifies the area error for the n^{th} Monte Carlo iteration
104-203.	PRERRC	Word n+103 specifies the production error for the n^{th} Monte Carlo iteration
204-303.	YERRC	Word n+203 specifies the yield error for the n^{th} Monte Carlo iteration

Format of Second Country Data Record:

Word(s)		Description
1.	CLEARF	Reference value of the area confidence level Est/Est
2.	CLEPRF	Reference value of the production confidence level Est/Est
3.	CLTARF	Reference value of the area confidence level True/Est
4-103.	CLEWA	Word n+3 specifies the area confidence level Est/Est for the n^{th} iteration
104-203.	CLEPRD	Word n+103 specifies the production confidence level Est/Est for the n^{th} iteration
204-303.	CLATEC	Word n+203 specifies the area confidence level True/Est for the n^{th} iteration

Format of Third Country Data Record:

Word(s)		Description
1.	CLTPRF	Reference value of the production confidence level True/Est
2.	CLAWCR	Reference value of the area confidence level True/WC
3.	CLPWCR	Reference value of the production confidence level True/WC
4-103.	CLPTEC	Word n+3 specifies the production confidence level True/Est for the n^{th} iteration
104-203.	CLATWC	Word n+103 specifies the area confidence level True/WC for the n^{th} iteration
204-303.	CLPTWC	Word n+203 specifies the production confidence level True/WC for the n^{th} iteration

Format of Region or Zone Data Records:

Word(s)		Description
1.	AEREFR or AEREFZ	Reference value for area error
2.	PEREFR or PEREFZ	Reference value for production error
3.	YEREFR or YEREFZ	Reference value for yield error
4-103.	AERRR or AERRZ	Word n+3 specifies the area error for the n^{th} Monte Carlo iteration
104-203.	PRERRR or PRERRZ	Word n+103 specifies the production error for the n^{th} iteration
204-303.	YERRR or YERRZ	Word n+203 specifies the yield error for the n^{th} iteration

Recommended Blocking Factor: 1

File Size: 343,405 words

2.4.18 Index Matrix Location File - INDEXMAT

This file contains grid numbers or INDEXS for global coverage. Each index is associated with an (I,J) element corresponding to the stereographic projection coordinate of a given latitude and longitude.

Access Method: Direct with fixed length records - uses FORTRAN V direct access routines.

Status: Almost permanent, may never be regenerated.

Sort: By I, J value $1 \leq J \leq 250$ and for each J, $1 \leq I \leq 500$. Each record corresponds to a value of J. There are 251 records counting the header record.

Media: Disk-FASTRAND

Record Formats:

Header Record:

Name(2) - File Name = 'INDEXMAT' 499 words of filler

Detail Record:

For 1 value of J there are 500 index values, 1 for each I, 1 to 500. The index value is an integer 1-16000.

Blocking Factor: 1

File Size: 125,500 words

Usage: This file is used as input to LUMP to obtain the index value for each segment.

3.0 PROCEDURES AND REQUIREMENTS FOR EACH PROGRAM IN LACIE

3.1 EPHEMS

Operational Assumptions

- There can be a maximum of two vehicles.
- There can be a maximum of 549 days.
- The latitude band for swath table generation is $\pm 65^{\circ}$ latitude and there will be a maximum of 100 latitude points to process.
- Only one case is run at a time.
- The complete card data set must be entered for each run.
- The existing swath tables will be destroyed each time this program is run.
- The swath tables will be designated as permanent files since it is assumed that this program will be run about once per year.
- Fixed field card formats are utilized.
- A sun synchronous inclination will be computed for each run condition.
- Only first order oblateness terms are modeled in the orbit generation; i.e., nodal regression and apsidal precession.
- Orbital elements are maintained as Keplerian elements (a, e, i, Ω, ω, t) and are updated on a rev-by-rev basis.
- Orbit initialization equations will insure passage through a reference point at a specified time on the first day. Active passage is assumed to be on the descending pass.

3.1.1 Input Card Data

3.1.1.1 Input Data Description

See Tables 3.1-1 and 3.1-2.

Table 3.1-1. EPHEM Program Control Input

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
ICASE		1	0	1-9999	--	A 4 digit case number to identify the printed output and the swath tables
NODAY		1	549	1-549	--	No. of days to generate ephemeris data for the swath table
IVEH		1	2	1-2	--	Number of vehicles to process
HEADER		18	Blanks	---	--	Provision for an 72 character case header to print out at the top of every output print page
LIDEBG		4	F (Blank)	T or F	--	Flag to allow printout of intermediate data for swath calculations. Data for the following routitnes is printed based on subscript values: 1. SWATH 2. Swath table and 4. REVTAB reference file
INLAT		2	5, 65	0-65	Deg	Northern Hemisphere latitude band for swath generation
ISLAT		2	15, 45	0-65	Deg	Southern Hemisphere latitude band for swath generation
IPPI5(10)		10	1, 549 8*0	1-549	--	Ephemeris data display flag = [start day, end day] pairs
ISOSTR		1	6	0-12	--	No. of months delay to start the generation of swath data on the swath table for the southern latitudes

Table 3.1-2. Orbital Determination Input

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
IV1TIM		6	0	→	→	Vehicle 1 reference latitude passage time IV1TIM(1)-(Year-1900); IV1TIM(2)-Month no. IV1TIM(3)-Day No.; IV1TIM(4)-Hours IV1TIM(5)-Minutes; IV1TIM(6)-Seconds
IV2TIM		6	0	→	→	Vehicle 2 reference latitude passage time; same information as Vehicle 1.
ORBIT1		6	0			Orbital elements for Vehicle 1
(1)	a			6650 to 7700	Kilom.	Semi-major axis
(2)	e			10^{-5}<.15	--	Eccentricity
(4)	Ω			0-360	Deg.	Longitude of reference latitude
(5)	ω			0-360	Deg.	Argument of perigee
(6)	τ			$\pm 65^{o}$	Deg.	Vehicle reference latitude
ORBIT2		6	0			Orbital elements for Vehicle 2. Same data as for Vehicle 1.
SA		3	0	-10-+10	Deg.	Reference scan angles defining swath field of view

3.1.1.2 Card Formats

See Table 3.1-3.

3.1.1.3 Deck Setup

The order of input is:

1. Header card
2. Program Control Card
3. Orbital determination data (2 cards)

3.1.1.4 Rules for Entering Data on Cards

3.1.1.4.1 General

1. Integers must be entered right justified.
2. F-format numbers must have the decimal point present, i.e., F5.1-XXX.X, F4.0-XXX.
3. The card sequence numbers in the C.C. 79-80 must be present in all data cards.

3.1.1.4.2 Rules for Specific Fields

IVEH - No more than 2 vehicles can be entered in this field.

NODAY - A number larger than 549 will not be accepted.

IYR - An entry less than 64 will not be accepted.

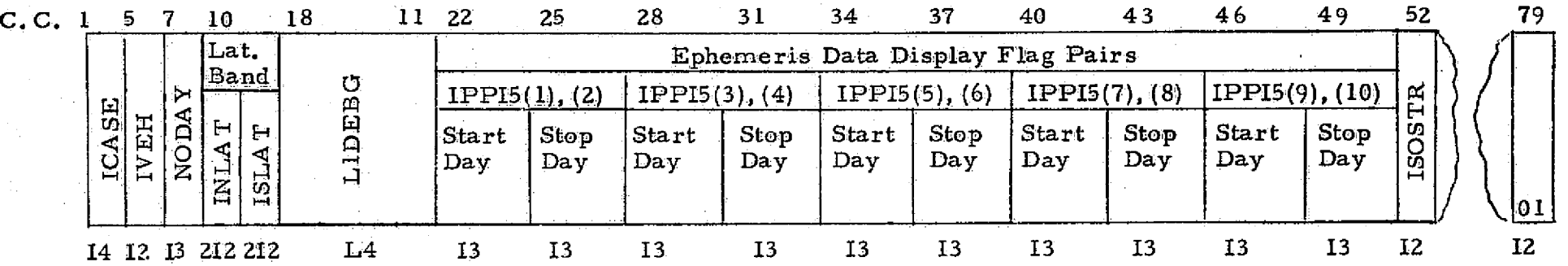
INLAT and ISLAT - A negative entry or an entry greater than 65 will not be accepted. The total number of latitudes allowed, represented by the combined bands, is 100.

IPPI5 - An entry larger than 549 will not be accepted.

SA - An absolute value greater than 10° is not allowed.

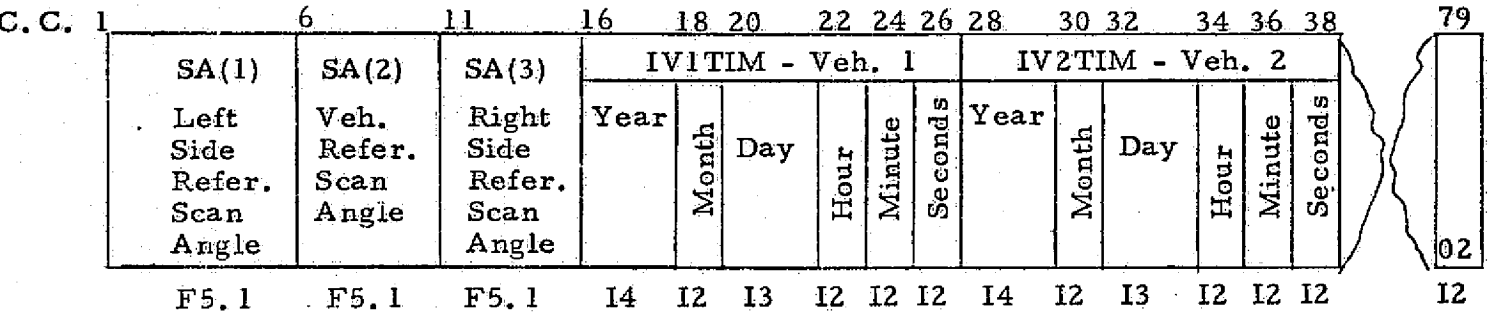
IV1TIM and IV2TIM - The first subscript entry (year) must be between 1964 and the present.

Table 3.1-3. PROGRAM CONTROL CARD FORMAT



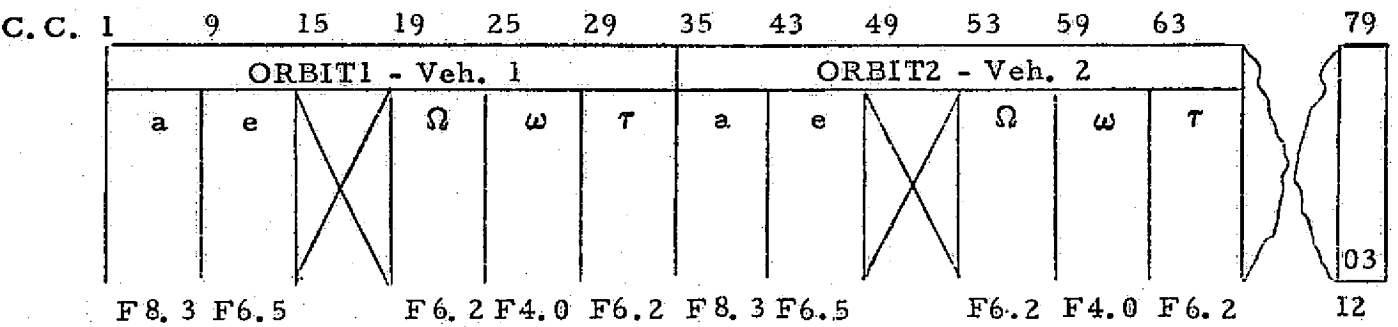
ORBITAL DETERMINATION DATA CARD FORMATS

CARD 1



Data Types	
I	- Integer
AN	- Alphanumeric
F	- Floating Decimal
L	- Logical (T or F)

CARD 2



3.1.2 Sample Card Inputs

```
                                                              HEADER
TEST CASE FOR HANDOFF,SYS. TEST 1 - 40 DAY SWATH,12/30/75 START,2 VEHICL

TCASE  IVEH  NODAY  INLAT   ISLAT   LIDERG          IPPIS START/STOP TIMES                    ISUSIR
    1     2     40  15  65  20  65   FTFF    1  40    0    0    0    0    0    0    0    0      1   01

         SA                  IV1TIM                   IV2TIM
-10.0     .0     9.9   75 12 30 10 15 40   75 12 31  5 -0 -0                                        02

                  ORBIT1                                   ORBIT2
7290.0  .05500     0.  345.    50.    7660.4  .02500  105.  290.    20.                             03
```

3.1.3 Output Report Data Definitions

See Table 3.1-4.

Table 3.1-4. EPHEM Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
WP	ω	$0-2\pi$	Radians	1.	Argument of perigee
NREV ≡ REV	-	1-18	--	1., 3.	Current orbital revolution number in a day
TMNODE ≡ (Node Time)	-	0-86,400	Sec	1., 3.	Time during a rev that ascending node crosses equator
CARUS ≡ (Node Longitude)	Ω	$0-2\pi$ 0-360	Radians or deg, min, sec	1. 3.	Longitude of ascending node
VEHICLE	-	102	--	1., 2., 3.	Vehicle number
DAY	-	1-549	Day	1., 2.	Day no. of mission
LATNO	λ	-65-+65	Degrees	2., 4.	Latitude of a vehicle
IALT	-	800-1800	Kilom.	2.	Altitude above the earth of a vehicle
TIME	-	0-86,400	Sec.	2.	Swath latitude crossing time extremes
DLONGI	ϕ	$0-2\pi$	Radians	2.	Swath latitude crossing longitude extremes
Semi-Major Axis	a	6650-7700	Kilom.	3.	---
Eccentricity	e	10^{-5}-.15	--	3.	---
Period	p	6000-6500	Sec.	3.	---
Inclination	i	70-120	Deg, min sec	3.	---
Argument of Perigee	ω	0-360	Deg, min, sec	3.	---
Rt. Asg. Greenwich	α	0-360	Deg, min sec	3.	---
DLONMX	ϕ	$0-2\pi$	Radians	4.	Maximum value of DLONGI at any latitude
DLONMN	ϕ	$0-2\pi$	Radians	4.	Minimum value of DLONGI at any latitude

3.1.4 Sample Pages from Each Output Report

1. See Figure 3.1-1 for Sample Swath Reference Record.
2. See Figure 3.1-2 for Sample Swath Table Record
3. See Figure 3.1-3 for Sample Ephemeris Display
4. See Figure 3.1-4 for Sample Table Search Record

TEST CASE FOR HANDOFF,SYS. TEST 1 - 40 DAY SWATH,12/30/75 START,2 VEHICL LPP SIMULATION CASE 1 PAGE 1

SWATH REFERENCE RECORD VEHICLE 1 DAY 1

WP	NREV	TMNODE	CARUS
.601916+01	1	.995253+04	.491339+01
	2	.161531+05	.446247+01
	3	.223536+05	.401156+01
	4	.285541+05	.356064+01
	5	.347546+05	.310972+01
	6	.409551+05	.265881+01
	7	.471557+05	.220789+01
	8	.533562+05	.175698+01
	9	.595567+05	.130606+01
	10	.657572+05	.855147-00
	11	.719578+05	.404232-00
	12	.781583+05	.623650+01
	13	.843588+05	.578559+01

Figure 3.1-1. Sample Swath Reference Record

TEST CASE FOR HANDOFF.SYS. TEST 1 = 40 DAY SWATH,12/30/75 START,2 VEHICL LPP STMULATION CASE 1 PAGE 2

SWATH TABLE RECORD VEHICLE 1 DAY 1

	LAINO	JAIT	TIME(1)	TIME(2)	TIME(3)	DLONG1(1)	DLONG1(2)	DLONG1(3)
	65	11493	1879.	1893.	1905.	.343552+01	.335225+01	.327176+01
	64	11556	1899.	1913.	1925.	.341501+01	.333487+01	.325725+01
	63	11617	1919.	1933.	1948.	.339610+01	.331867+01	.324066+01
	62	11677	1939.	1952.	1963.	.337646+01	.330555+01	.323090+01
	61	11736	1959.	1972.	1983.	.336194+01	.328938+01	.321887+01
	60	11794	1979.	1992.	2002.	.334643+01	.327605+01	.320750+01
	59	11850	1999.	2011.	2021.	.333182+01	.326342+01	.319672+01
	58	11906	2019.	2031.	2040.	.331802+01	.325147+01	.318608+01
	57	11961	2038.	2050.	2060.	.330495+01	.324012+01	.317672+01
	56	12014	2058.	2069.	2079.	.329254+01	.322930+01	.316741+01
	55	12066	2078.	2089.	2098.	.328075+01	.321896+01	.315850+01
	54	12117	2097.	2108.	2117.	.326953+01	.320911+01	.314995+01
	53	12167	2117.	2128.	2137.	.325880+01	.319965+01	.314173+01
	52	12216	2137.	2147.	2156.	.324853+01	.319057+01	.313381+01
	51	12264	2156.	2166.	2175.	.323867+01	.318184+01	.312617+01
	50	12311	2176.	2186.	2194.	.322920+01	.317343+01	.311879+01
	49	12356	2195.	2205.	2213.	.322007+01	.316533+01	.311164+01
	48	12401	2215.	2225.	2233.	.321128+01	.315749+01	.310471+01
	47	12448	2234.	2244.	2252.	.320279+01	.314991+01	.309798+01
	46	12486	2254.	2263.	2271.	.319458+01	.314255+01	.309145+01
	45	12526	2273.	2283.	2290.	.318666+01	.313542+01	.308507+01
	44	12566	2293.	2302.	2310.	.317892+01	.312846+01	.307886+01
	43	12604	2312.	2321.	2329.	.317145+01	.312173+01	.307281+01
	42	12641	2332.	2341.	2348.	.316419+01	.311519+01	.306690+01
	41	12677	2351.	2360.	2368.	.315713+01	.310874+01	.306112+01
	40	12712	2371.	2380.	2387.	.315025+01	.310247+01	.305547+01
	39	12745	2390.	2399.	2406.	.314354+01	.309635+01	.304992+01
	38	12777	2410.	2418.	2426.	.313699+01	.309037+01	.304449+01
	37	12808	2429.	2438.	2445.	.313060+01	.308451+01	.303915+01
	36	12837	2449.	2457.	2464.	.312434+01	.307877+01	.303391+01
	35	12865	2469.	2477.	2484.	.311822+01	.307314+01	.302875+01
	34	12892	2488.	2496.	2503.	.311222+01	.306762+01	.302368+01
	33	12918	2508.	2515.	2522.	.310634+01	.306219+01	.301868+01
	32	12942	2527.	2535.	2542.	.310057+01	.305685+01	.301376+01
	31	12965	2547.	2554.	2561.	.309491+01	.305160+01	.300890+01
	30	12986	2566.	2574.	2581.	.308936+01	.304645+01	.300410+01
	29	13007	2586.	2593.	2600.	.308389+01	.304135+01	.299937+01
	28	13025	2605.	2613.	2619.	.307851+01	.303631+01	.299469+01
	27	13043	2625.	2632.	2639.	.307321+01	.303135+01	.299006+01
	26	13059	2644.	2652.	2658.	.306800+01	.302645+01	.298549+01
	25	13074	2664.	2671.	2678.	.306285+01	.302162+01	.298096+01
	24	13087	2683.	2691.	2697.	.305777+01	.301684+01	.297647+01
	23	13099	2703.	2710.	2717.	.305276+01	.301211+01	.297202+01
	22	13110	2722.	2729.	2736.	.304782+01	.300744+01	.296760+01
	21	13119	2742.	2749.	2755.	.304295+01	.300281+01	.296322+01
	20	13127	2761.	2768.	2775.	.303809+01	.299822+01	.295888+01
	19	13133	2781.	2788.	2794.	.303331+01	.299366+01	.295456+01
	18	13138	2800.	2807.	2814.	.302857+01	.298917+01	.295027+01

Figure 3.1-2. Sample Swath Table Record

TEST CASE FOR HANDOFF.SYS. TEST 1 - 40 DAY SWATH,12/30/75 START,2 VEHICL LPP SIMULATION CASE 1 PAGE 3

I-S PREDICTOR EPHEMERIS DISPLAY FOR DATE 12/30/75

VEHICLE 1

SEMI-MAJOR AXIS	= 7290.000
ECCENTRICITY	= .05500000
PERIOD	= 6200.523
INCLINATION	= 99 2 28
ARGUEMENT OF PERIGEE	= 344 52 20
RT. ASC. GREENWICH	= 97 48 41

REV	NODE TIME	NODE LONGITUDE
1)	9952.5311	281 30 59
2)	16153.0539	255 40 51
3)	22353.5770	229 50 43
4)	28554.1000	204 0 35
5)	34754.6230	178 10 27
6)	40955.1450	152 20 19
7)	47155.6670	126 30 11
8)	53356.1890	100 40 3
9)	59556.7120	74 49 55
10)	65757.2340	48 59 47
11)	71957.7570	23 9 39
12)	78158.2800	357 19 31
13)	84358.8020	331 29 23

Figure 3.1-3. Sample Ephemeris Display

TEST CASE FOR HANDOFF,SYS. TEST 1 - 40 DAY SWATH,12/30/75 START,2 VEHICL LPP SIMULATION CASE 1 PAGE 121

SWATH TABLE SEARCH RECORD VEHICLE 1

LATNO	DLONMX	DLONMN
65	.304024+01	.284798+01
64	.305339+01	.286867+01
63	.306574+01	.288764+01
62	.307745+01	.290566+01
61	.308853+01	.292253+01
60	.309897+01	.293798+01
59	.310898+01	.295266+01
58	.311857+01	.296648+01
57	.312785+01	.297960+01
56	.313603+01	.299199+01
55	.314431+01	.300372+01
54	.315227+01	.301491+01
53	.315993+01	.302561+01
52	.316733+01	.303586+01
51	.317448+01	.304569+01
50	.318141+01	.305511+01
49	.318813+01	.306417+01
48	.319465+01	.307290+01
47	.320099+01	.308135+01
46	.320715+01	.308951+01
45	.321312+01	.309742+01
44	.321898+01	.310509+01
43	.322468+01	.311254+01
42	.323024+01	.311979+01
41	.323569+01	.312684+01
40	.324103+01	.313371+01
39	.324626+01	.314040+01
38	.325139+01	.314694+01
37	.325643+01	.315332+01
36	.326138+01	.315955+01
35	.326624+01	.316565+01
34	.327106+01	.317163+01
33	.327579+01	.317749+01
32	.328046+01	.318324+01
31	.328507+01	.318888+01
30	.328961+01	.319443+01
29	.329410+01	.319989+01
28	.329854+01	.320526+01
27	.330292+01	.321055+01
26	.330727+01	.321577+01
25	.331158+01	.322090+01
24	.331584+01	.322597+01
23	.332007+01	.323098+01
22	.332425+01	.323591+01
21	.332842+01	.324079+01
20	.333255+01	.324562+01
19	.333666+01	.325039+01
18	.334074+01	.325511+01

Figure 3.1-4. Sample Table Search Record

3.1.5 File Requirements

Input: None

Output: SWATH - Swath Table File
SWATHR - Swath Reference File

3.1.6 Error and Recovery

3.1.6.1 General

The program will attempt to find as many sources of error during the input card processing as possible. The program will continue checking for further input errors upon detecting any input error. Since most of the computations are contained in subroutines which already exist, the philosophy of continuing processing after detection will be retained. There are two levels of error. These are:

Level 1 - continue processing

Level 2 - job fatal

When a level 1 error occurs, the program will print an informative message and continue. If such an error occurs during the calculation phase, a printout of key data quantities is given in addition. When a level 2 error occurs, the program will print an informative message and return control back to the computer system.

3.1.6.2 Input Errors

Level 2

1. A check is made to see if NODAY is between 1 and 549. Message:

   ***NODAY IS OUT OF RANGE. IT IS NOT BETWEEN 1 AND 549

2. A check is made to see if INLAT and ISLAT are each between 0 and 65. In addition, ISLAT(1) (INLAT(1)) must be ≤ ISLAT(2), (INLAT(2)). Message:

   ***INLAT OR ISLAT IS OUT OF RANGE. THEY ARE NOT BETWEEN 0 AND 65 OR THE FIRST VALUE OF EITHER ONE IS NOT LESS THAN OR = TO THE SECOND.

3. A check is made to make sure the number of latitude points is less than 101 as specified by ISLAT and INLAT. Message:

***THE TOTAL NUMBER OF LATITUDE POINTS SPECIFIED BY ISLAT AND INLAT EXCEEDS 100.

4. A check is made to see if each entry pair for IPPI5 has entries between 1 and 549 and the first entry of a pair is ≤ to the second. Message:

   ***IPPI5(N) AND IPPI5(N+1) ARE OUT OF RANGE. THEY ARE NOT BETWEEN 1 AND 549 OR THE VALUE OF THE FIRST ENTRY IN A PAIR IS NOT LESS THAN OR = TO THE SECOND.

5. IVEH is checked to be between 1 and 2. No more than 2 vehicles can be processed by this program. Message:

   ***IVEH IS NOT BETWEEN 1 AND 2.

6. A check is made to see if each SA entry is in the range of -10 to +10 and is in ascending order and unequal to each other. Message:

   ***EITHER AN SA ENTRY IS NOT BETWEEN 0 AND ABS(10) OR ENTRY(N) IS NOT LESS THAN ENTRY(N+1)

7. A check is made to make sure IV1TIM(1) or IV2TIM(1) is greater than 1963. Message:

   ***EITHER IV1TIM(1) OR IV2TIM(1) IS NOT GREATER THAN 1963.

8. ORBIT1(1) and ORBIT2(1)-a are checked to be in the range of 6650 and 7700 kilometers. Message:

   ***EITHER ORBIT1(1) OR ORBIT2(1) IS NOT BETWEEN 6650 AND 7700 KILOMETERS.

9. A check is made to make certain that ORBIT1(2) and ORBIT2(2)-e is in the range .00001 and .15. Message:

   ***EITHER ORBIT1(2) OR ORBIT2(2) IS NOT BETWEEN .00001 AND .15.

10. A check is made to make sure that ORBIT1(4) and ORBIT2(4)-$\Omega$is in the range 0 and 360. Message:

    ***EITHER ORBIT1(4) OR ORBIT2(4) IS NOT BETWEEN 0 AND 360.

11. A check is made to make sure that ORBIT1(5) and ORBIT2(5)-ω is in the range 0 and 360. Message:

    ***EITHER ORBIT1(5) OR ORBIT2(5) IS NOT BETWEEN 0 AND 360.

12. A check is made to make sure that ORBIT1(6) and ORBIT2(6)-τ is in the range $\pm$65. Message:

    ***EITHER ORBIT1(6) OR ORBIT2(6) IS NOT BETWEEN -65 AND +65.

13. A check is made to make sure IV1TIM(4) or IV2TIM(4) specifies an hour such that the local vehicle passage time is between 700 to 1700 hours. Message:

    ***IV1TIM(4) OR IV2TIM(4) SPECIFIES A LOCAL VEHICLE PASSAGE TIME NOT BETWEEN 700 AND 1700 HOURS.

14. A check is made to make sure IV1TIM(3) or IV2TIM(3) is in the range 1 and 31. Message:

    ***IV1TIM(3) OR IV2TIM(3) IS NOT BETWEEN 1 AND 31.

15. A check is made to make sure IV1TIM(2) or IV2TIM(2) is in the range 1 and 12. Message:

    ***IV1TIM(2) OR IV2TIM(2) IS NOT BETWEEN 1 AND 12.

16. If one or more of the above errors occur, the following message will print:

    ***THIS JOB IS ABANDONED DUE TO THE FACT THAT 1 OR MORE FATAL INPUT ERRORS OCCURRED.

3.1.6.3 Processing Errors

Level 1

1. A check is made in subroutine HECTOR after attempting to solve for the eccentricity anomaly that the iteration loop converged on a solution. Message:

   ***ERROR (KEPLER) SOLUTION FOR ECC. ANOMALY DID NOT CONVERGE AFTER 50 ITERATIONS.

2. A check is made in subroutine REVTAB to determine if an anomaly occurred in calculating crosstrack latitudes. If so, the following message is printed followed by data:

   REVTAB ERROR - ANOMALY IN CROSSTRACK LATITUDES

   Values for K, L, AA, JJ, DEL, XI, INT, NTRY, and LLL are then printed.

3. A check is made in subroutine SWATH to make sure the iteration count of 5 is not exceeded in computing geocentric latitude and delta longitude. Message:

   Iteration limit on SWATH. Values for XLONGN, TEM, DXLON, R(1), R(2), IFLG are then printed.

3.1.6.4 Input/Output Errors

For sequential I/O the FORTRAN system on the UNIVAC takes control and prints a message identifying the problem and will either continue processing or abandon the job. If processing continues, the system counts the number of times this error re-occurs and if it happens a certain number of times, the system will abandon the job.

For direct access I/O, the UNIVAC D.A. I/O package prints out an informative message, sets an error flag and allows processing to continue. In this program the swath table file is the only direct access file. Immediately after the informative message, the following message will print:

***AN IRRECOVERABLE I/O ERROR HAS OCCURRED ON WRITING A RECORD TO THE SWATH TABLE. THE JOB IS BEING ABANDONED.

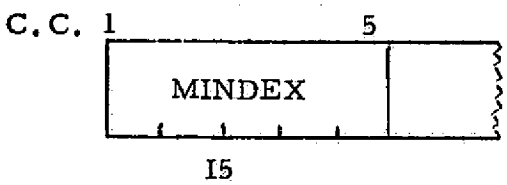
3.2 GRID

3.2.1 Input Card Data

3.2.1.1 Input Data Description

MINDEX - maximum number of index points to process on the NASA climatology tape. Range 1 to 16000, nominal value is 16000 (used to reduce run time for debugging cases).

3.2.1.2 Card Format



3.2.2 Sample Card Inputs

None.

3.2.3 Output Report Data Definitions

There is no normal printed output for this utility program.

3.2.4 Sample Pages from Each Output Report

None.

3.2.5 File Requirements

Input: WEATAP - NASA Climatology Tape
Output: INDMAT - Index Grid Matrix File

3.2.6 Error and Recovery

3.2.6.1 General

There are only three checks made for errors, one of which is fatal.

3.2.6.2 Error Checks and Messages

Fatal

1. A check is made to make sure MINDEX on the input card is between 0 and 16000. If not, the following message prints and the program stops.

Message:

MINDEX IS NOT BETWEEN 0 AND 16000. PROGRAM IS TERMINATED.

Non-Fatal

2. A check is made to make sure the index no. read from WEATAP file is between 1 and 16000. If not, the index no. is not included in the current INDMAT file record and the program reads the next WEATAP record.

   Message:

   THE INDEX NO. READ FROM WEATAP IS NOT BETWEEN 1 AND 16000. THE DATA IS IGNORED.

3. A check is made to see if an IGRID, JGRID grid pair has already been assigned an index number. If so, a message is printed and the current index no. replaces the one originally stored.

   Message:

   THE GRID PAIR IGRID nnn JGRID nnn HAS AN INDEX NUMBER ALREADY ASSIGNED.

3.3 LUMP

Operational Assumptions

- Only one case is run at a time.
- Data Input Cards for the Sample Segments are sorted by country, region, zone, strata, substrata, segment.
- Data Input Cards for the Substrata and Crop Calendar data are sorted by country, region, zone, strata, substrata.
- Program is a one pass process in which cards are checked, written to disk if no fatal errors, and then LUMP is executed.
- Maximum of 2000 training segments total.
- The input cards for Substrata Historical data, Substrata Statistical data, Crop Calendar data, Crop Calendar Error data, and Sample Segment data are stored on separate input files.
- The United States must be assigned the symbol 'USA ' and Canada must be assigned the symbol 'CAND'.

3.3.1 Input Card Data

3.3.1.1 Input Data Description

See Table 3.3-1.

3.3.1.2 Card Formats

See Tables 3.3-2 and 3.3-3.

Table 3.3-1. LUMP Input Data Description

NAME	SYMBOL	DIMENSION	NOMINAL VALUE	RANGE	UNITS	DESCRIPTION
ICASE		1		0-9999		Identification case number for sample segment data (I5)
ISEG		1		0-9999		Segment number (I4)
ICTRY		1				Four character country name (i.e., USA, USSR)
IREG		1		0-999		Region number (I3)
IZONE		1		0-999		Zone number (I3)
ISTRAT		1		0-9999		Strata number (I4)
ISUB		1		0-9999		Substrata number (I4)
NAMSUB		2				Substrata name (2A4)
SUBAR				0-999999999	acres or hectares	Substrata total area (USA and Canada acres, USSR and others-hectares) (floating point, F10.0)
HISTPW	$\widetilde{PW}$	1		0-100		% wheat in substrata (floating point, F7.3)
ISW		1		S, W		Spring or winter wheat indicator: S = Spring, W = Winter
DEVTPW	δPW	1		-9.999 to 9.999		Deviation to true proportion wheat (floating point, F6.3)
CV1	CV_1	1		0-9.999		Coefficient of variation for year-to-year change in proportion wheat (floating point, F5.3)
CV2	CV_2			0-9.999		Coefficient of variation for within county variation of proportion wheat (floating point, F5.3)
CV3	CV_3			0-9.999		Coefficient of variation for within county variation of proportion mixed pixels (floating point, F5.3)
DEVTPM	δPM			9.999		Deviation of true proportion mixed pixels (floating point, F5.3)
ITYPE				0-3		Card type (Ii) =0 Substrata Historical Data =1 Substrata Statistical Data =2 Substrata Crop Calendar Data =3 Substrata Crop Calendar Error Data =4 Sample Segment Location Data
LAT		1		$\pm$ 65°	Deg, Min	Latitude with N or S indicating + or - respectively (A1, I2, I3)

Table 3.3-1. LUMP Input Data Description (cont'd)

NAME	SYMBOL	DIMENSION	NOMINAL VALUE	RANGE	UNITS	DESCRIPTION
LONG		1		±180°	Deg, Min	Longitude with E or W indicating + or 1 respective (A1, I2, I3)
IMOT		8		1-12		Date month, day, year of each of 4 phases for start phase and stop phase 4(1X, 6I2) for winter or spri wheat
IDAT		8		1-31		
IYRT		8		64-99		
RSEED		1		1.0-NNNNNNNN NN		Floating point odd whole number used as seed to random number generator (D12.0)
ILIST		1		0.1		List option to list all input data cards or only those in error (I2) =0 Only those in error =1 List all input data cards
ISHD		1				Unit number of Substrata Historical Data (I2)
ISSD		1				Unit number for Substrata Statistical Data (I2)
ISID		1				Unit number for Segment ID Data (I2)
ISCW		1				Unit number for Segment Crop Window Data (I2)
ICWE						Unit number for Crop Calendar Error File (I2) - Se to 38 (8)
ITSFG				0, 1		Training Segment Flag (I2) =0 If all segments are training segments =1 If the training segment list is specified, via segment location data cards.
NAGR		1		1-9999		Number of agricultural segments in a substrata
NAL		1		1-9999		Number of allocated segments in a substrata
CV4		1		0-9.999		Multi-yr Std. deviation of historical wheat area
IGRP		1		1-3		Group no assignment for a substrata
DELTWE	δ_1-δ_4	4		±1.0		Delta error for winter in predicting the bio windo dates, expressed at fraction of the window interva
IPLNTE	δ_0	1		±99	Days	Error in the mean planting date of the substrata relative to the true mean value.

Table 3.3-1. LUMP Input Data Description (cont'd)

NAME	SYMBOL	DIMENSION	NOMINAL VALUE	RANGE	UNITS	DESCRIPTION
SEGSD	σ	1		0-99	Days	Within substrata variation for winter in crop calendar due to change in latitude, altitude, planting date, etc.
TRIND	-	1	0	0-1		0- training segment, 1- ordinary segment
TLIST	-	6		0-9999		List of segment numbers of training segments associated with the ordinary segment. These segments are to be listed in order of decreasing priority. Highest priority is first.
SW1	-	1		S or W		Spring or winter wheat indicator from
SW2	-	1		S or W		Crop calendar data
ELWE1	$\delta_1-\delta_4$	4		$\pm$1.0		Delta error for spring - same as DELTWE
PLNT1	δ_0	1		$\pm$99	Days	Same as IPLNTE only for spring
SGSD1	σ	1		0-99	Days	Same as for ISEGSD only for spring

Table 3.3-2. LUMP Control Card

CC 1		9	21	26		31		36		41		46		51		56
Case No.		Random No. Seed		List Option		Training Seg Flag		Unit for Subst Hist		Unit for Subst Stat		Unit for Seg ID		Unit for Crop Calen.		Unit for Crop Error
I5		D12.0		I2		I2		I2		I2		I2		I2		I2

SUBSTRATA HISTORICAL DATA

CC 6	11	15	19	24	28	36	46	53	57	61	80
Country	Reg	Zone	Strata	Sub-Strata	Sub-Strata Name	Sub-Strata Total Area	Hist. PW	N_{AGR}	N_{AL}	Group	0
A4	I3	I3	I4	I4	A8	F10.0	F7.3	I4	I4	I1	

SUBSTRATA STATISTICAL DATA

CC 6	11	15	19	24	28	34	39	44	49	54	80
Country	Reg	Zone	Strata	Sub-Strata	Deviation True PW	Coeff. True PW	Coeff. True PW	Coeff. True PW	Ratio True PM	Multi-Yr Std. Dev. WA	1
A4	I3	I3	I4	I4	F6.3	F5.3	F5.3	F5.3	F5.3	F5.3	

SUBSTRATA CROP CALENDAR DATA

CC 6	11	15	19	24	29	42	55	68	80
Country	Reg	Zone	Strata	Sub-strata	S or W	Crop Phase 1	Crop Phase 2	Crop Phase 3	Crop Phase 4	2
						Start: Y M D; Stop: Y M D	Start: Y M D; Stop: Y M D	Start: Y M D; Stop: Y M D	Start: Y M D; Stop: Y M D	
A4	I3	I3	I4	I4	6I2	6I2	6I2	6I2		

1 Card For Spring and 1 For Winter

CROP CALENDAR ERROR DATA

CC 6	11	15	19	24	28	33	38	43	48	51	53	58	63	68	73	76	80
Country	Reg.	Zone	Strata	Sub-strata	BioWin 1 Error Winter δ_1	BioWin 2 Error Winter δ_2	BioWin 3 Error Winter δ_3	BioWin 4 Error Winter δ_4	Mean Plt. Date Error	Crop Cal. STD Dev.	BioWin 1 Error Spring δ_1	BioWin 2 Error Spring δ_2	BioWin 3 Error Spring δ_3	BioWin 4 Error Spring δ_4	Mean Plt. Date Error	Crop Cal. STD Dev.	3
A4	I3	I3	I4	I4	4F5.3				I3	I2	4F5.3				I3	I2	

SAMPLE SEG LOCATION DATA

1	6	11	15	19	24	29	36	44	46	48	80
- t	Country	Reg	Zone	Strata	Sub-strata	Latitude: N S, Deg, *, Min	Longitude: E W, Deg, *, Min	S or W	Tr. Index	Training Segment Priority List: Prior. 1, Prior. 2, Prior. 3, Prior. 4, Prior. 5, Prior. 6	4
	A4	I3	I3	I4	I4	A1I2 A1I2	A1I3 A1I2	A1	I1	6I4	

Table 3.3-3. LUMP Data Cards

3.3.1.3 Deck Setup

The order of the input is:

1. Control Cards
2. Substrata Historical and Statistical Data Cards
3. Crop Window data cards and Crop Window Error Data
4. Sample Segment ID Cards

3.3.1.4 Rules for Entering Data on Cards

3.3.1.4.1 General

- Integers must be right justified.
- F-format or D-format numbers must have the decimal point present.
- There is a crop window card necessary for spring and winter. If either spring or winter are not required, only one card need be input.

3.3.1.4.2 Rules for Specific Fields

See Section 3.3.1.1.

3.3.2 Sample Card Inputs

LISTING OF INPUT CARD IMAGES

CONTROL CARD

1 .100000000000+001 2 1 9 10 11 12 8

3.3.3 Output Report Definitions

There are no normal report data items.

3.3.4 Sample Pages from Each Output Report

The following pages are samples of a card image printout and file contents dumps as controlled via ILIST.

SUBSTRATA HISTORICAL AND STATISTICAL DATA

USA	1	4	20	1APACHE	1000000.	20.000	39	402	0
USA	1	4	20	1	.050	.100	.100	.100	.500	.100	1
USA	1	4	20	5COCONINO	1000000.	20.000	39	402	0
USA	1	4	20	5	.050	.100	.100	.100	.500	.100	1
USA	1	4	20	15MOHAVE	1000000.	20.000	39	402	0
USA	1	4	20	15	.050	.100	.100	.100	.500	.100	1
USA	1	4	20	17NAVAJO	1000000.	20.000	39	402	0
USA	1	4	20	17	.050	.100	.100	.100	.500	.100	1
USA	1	4	20	25YAVAPAI	1000000.	20.000	39	402	0
USA	1	4	20	25	.050	.100	.100	.100	.500	.100	1
USA	1	4	50	13MARICOPA	1000000.	20.000	39	401	0
USA	1	4	50	13	.050	.100	.100	.100	.500	.100	1
USA	1	4	50	21PINAL	1000000.	20.000	39	401	0
USA	1	4	50	21	.050	.100	.100	.100	.500	.100	1
USA	1	4	70	27YUMA	1000000.	20.000	39	401	0
USA	1	4	70	27	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	3COCHISE	1000000.	20.000	39	401	0
USA	1	4	90	3	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	7GILA	1000000.	20.000	39	401	0
USA	1	4	90	7	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	9GRAHAM	1000000.	20.000	39	402	0
USA	1	4	90	9	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	11GREENLEE	1000000.	20.000	39	403	0
USA	1	4	90	11	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	19PIMA	1000000.	20.000	39	403	0
USA	1	4	90	19	.050	.100	.100	.100	.500	.100	1
USA	1	4	90	23SANTA CR	1000000.	20.000	39	403	0
USA	1	4	90	23	.050	.100	.100	.100	.500	.100	1
USA	1	10	20	2NEWCAST	1000000.	20.000	39	403	0
USA	1	10	20	2	.050	.100	.100	.100	.500	.100	1
USA	1	10	50	1KENT	1000000.	20.000	39	403	0
USA	1	10	50	1	.050	.100	.100	.100	.500	.100	1
USA	1	10	80	3SUSSEX	1000000.	20.000	39	403	0
USA	1	10	80	3	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	23DEER LOD	1000000.	20.000	39	403	0
USA	1	30	10	23	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	29FLATHEAD	1000000.	20.000	39	401	0
USA	1	30	10	29	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	39GRANITE	1000000.	20.000	39	403	0
USA	1	30	10	39	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	47LAKE	1000000.	20.000	39	402	0
USA	1	30	10	47	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	53LINCOLN	1000000.	20.000	39	402	0
USA	1	30	10	53	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	61MINERAL	1000000.	20.000	39	403	0
USA	1	30	10	61	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	63MISSOULA	1000000.	20.000	39	402	0
USA	1	30	10	63	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	77POWELL	1000000.	20.000	39	402	0
USA	1	30	10	77	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	81RAVALLI	1000000.	20.000	39	402	0
USA	1	30	10	81	.050	.100	.100	.100	.500	.100	1
USA	1	30	10	89SANDERS	1000000.	20.000	39	402	0
USA	1	30	10	89	.050	.100	.100	.100	.500	.100	1
USA	1	30	20	5BLAINE	1000000.	20.000	39	401	0

SUBSTRATA CROP CALENDER AND CALENDER ERROR DATA

```
USA   1   4   50   13W76 1 676 114 76 11576 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1   4   -0   -0 .000-.000 .000-.000  0 0-.000 .000-.000 .000  0 0  3
USA   1   4   50   21W76 1 676 114 76 11576 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1   4   70   27W76 1 676 114 76 11576 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1   4   90   90W76 1 676 114 76 11576 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   10   29S76 1 676 114 76 11576 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   -0   -0 .010 .010 .010 .010  2 1 .010 .010 .010 .010  1 2  3
USA   1  30   10   63W76 1 576 115 76 12276 123 76 12476 3 6 76 3 776 3 82
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   10   77S76 1 576 116 76 12376 124 76 12576 3 7 76 3 876 3 92
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20    5S76 1 676 1 8 76 11576 117 76 12576 127 76 13176 2 22
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   15S76 1 876 110 76 11776 119 76 12776 129 76 2 276 2 42
                  W76 1 576 1 7 76 11476 116 76 12476 126 76 13076 2 12
USA   1  30   20   35S76 1 576 113 76 12076 122 76 13076 2 1 76 2 576 2 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   41S76 1 576 114 76 12176 123 76 13176 2 2 76 2 676 2 82
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   51S76 1 576 117 76 12476 126 76 2 376 2 5 76 2 976 2112
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   71S76 11676 118 76 12576 127 76 2 476 2 6 76 21076 2122
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   73S76 11876 120 76 12776 129 76 2 676 2 8 76 21276 2252
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   20   99S76 11976 121 76 12876 130 76 2 776 2 9 76 21376 2242
                  W76 12076 122 76 12976 131 76 2 876 210 76 21476 2252
USA   1  30   20  101S76 12176 123 76 13076 2 1 76 2 976 211 76 21576 2262
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   19S76 1 676 1 8 76 11576 117 76 12576 127 76 13176 2 22
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   21S76 1 876 110 76 11776 119 76 12776 129 76 2 276 2 42
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   33S76 11076 112 76 11976 121 76 12976 131 76 2 476 2 62
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   55S76 1 576 113 76 12076 122 76 13076 2 1 76 2 576 2 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   83S76 1 576 115 76 12276 124 76 2 176 2 3 76 2 776 2 92
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   85S76 11576 117 76 12476 126 76 2 376 2 5 76 2 976 2112
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30   91S76 11776 119 76 12676 128 76 2 576 2 7 76 21176 2132
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   30  105S76 11976 121 76 12876 130 76 2 776 2 9 76 21376 2152
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   50   13W76 1 676 114 76 12176 122 76 12376 3 5 76 3 676 3 72
                  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0  0 0 0 0 0 0 00
USA   1  30   50   27S76 1 776 115 76 12276 123 76 12476 3 6 76 3 776 3 82
                  W76 1 876 116 76 12376 124 76 12576 3 7 76 3 876 3 92
USA   1  30   50   37W76 1 976 117 76 12476 125 76 12676 3 8 76 3 976 3102
```

SAMPLE SEGMENT ID

1002	USA	1	4	50	13	N17	54	E107	6	W	0	0	0	0	0	0	0	4
1066	USA	1	4	50	21	N17	48	E107	51	W	0	0	0	0	0	0	0	4
1316	USA	1	4	70	27	N18	15	E106	33	W	0	0	0	0	0	0	0	4
1317	USA	1	4	70	27	N17	51	E106	36	W	0	0	0	0	0	0	0	4
1067	USA	1	4	90	3	N17	18	E108	30	W	0	0	0	0	0	0	0	4
1725	USA	1	30	10	29	N19	6	E101	54	S	1	1529	-0	-0	-0	-0	-0	4
1726	USA	1	30	10	63	N18	15	E101	57	W	1	1739	-0	-0	-0	-0	-0	4
1727	USA	1	30	10	77	N18	6	E102	18	S	1	1529	-0	-0	-0	-0	-0	4
1528	USA	1	30	20	5	N19	0	E104	0	S	1	1529	-0	-0	-0	-0	-0	4
1529	USA	1	30	20	5	N18	39	E103	54	S	0	-0	-0	-0	-0	-0	-0	4
1728	USA	1	30	20	15	N18	42	E103	15	S	1	1529	-0	-0	-0	-0	-0	4
1729	USA	1	30	20	15	N18	42	E103	33	W	1	17391529	-0	-0	-0	-0		4
1730	USA	1	30	20	15	N18	30	E103	15	S	1	1529	-0	-0	-0	-0	-0	4
1731	USA	1	30	20	15	N18	30	E103	30	W	1	1739	-0	-0	-0	-0	-0	4
1732	USA	1	30	20	35	N19	3	E102	24	S	1	1529	-0	-0	-0	-0	-0	4
1733	USA	1	30	20	41	N19	0	E103	36	S	1	1529	-0	-0	-0	-0	-0	4
1734	USA	1	30	20	41	N19	6	E104	30	S	1	1529	-0	-0	-0	-0	-0	4
1735	USA	1	30	20	41	N19	0	E103	24	S	1	1529	-0	-0	-0	-0	-0	4
1736	USA	1	30	20	51	N19	6	E103	15	S	1	1529	-0	-0	-0	-0	-0	4
1530	USA	1	30	20	71	N19	0	E104	30	S	1	1529	-0	-0	-0	-0	-0	4
1531	USA	1	30	20	71	N18	33	E104	30	S	1	1529	-0	-0	-0	-0	-0	4
1737	USA	1	30	20	73	N18	56	E102	42	S	1	1529	-0	-0	-0	-0	-0	4
1738	USA	1	30	20	99	N18	36	E102	56	S	1	1529	-0	-0	-0	-0	-0	4
1739	USA	1	30	20	99	N18	36	E102	51	W	0	-0	-0	-0	-0	-0	-0	4
1740	USA	1	30	20	101	N19	18	E102	48	S	1	1529	-0	-0	-0	-0	-0	4
1741	USA	1	30	20	101	N18	57	E102	57	S	1	1529	-0	-0	-0	-0	-0	4
1532	USA	1	30	30	19	N19	0	E105	20	S	1	154515461547	-0	-0	-0			4
1533	USA	1	30	30	19	N19	0	E105	30	S	1	15461547154	5	-0	-0	-0		4
1534	USA	1	30	30	21	N18	15	E105	30	S	1	154715451546	-0	-0	-0			4
1535	USA	1	30	30	21	N18	0	E105	45	S	1	15451546	-0	-0	-0	-0		4
1536	USA	1	30	30	33	N18	15	E104	45	S	1	15451547	-0	-0	-0	-0		4
1537	USA	1	30	30	55	N18	15	E105	15	S	1	15461545	-0	-0	-0	-0		4
1538	USA	1	30	30	55	N18	15	E105	30	S	1	15461547	-0	-0	-0	-0		4
1539	USA	1	30	30	83	N18	30	E105	54	S	1	15471546	-0	-0	-0	-0		4
1540	USA	1	30	30	85	N18	30	E105	57	S	1	15471545	-0	-0	-0	-0		4
1541	USA	1	30	30	85	N18	45	E105	30	S	1	1545	-0	-0	-0	-0	-0	4
1542	USA	1	30	30	85	N18	42	E105	54	S	1	1546	-0	-0	-0	-0	-0	4
1543	USA	1	30	30	91	N19	3	E105	42	S	1	1547	-0	-0	-0	-0	-0	4
1544	USA	1	30	30	91	N18	57	E105	48	S	1	154715461545	1529	-0	-0	-0		4
1545	USA	1	30	30	105	N19	0	E105	0	S	0	-0	-0	-0	-0	-0	-0	4
1546	USA	1	30	30	105	N18	45	E105	[illegible]	C	0	-0	-0	-0	-0	-0	-0	4
1547	USA	1	30	30	105	N18	30	E104	45	S	0	-0	-0	-0	-0	-0	-0	4
1742	USA	1	30	50	13	N18	24	E103	0	W	1	174317451749174915291744						4
1743	USA	1	30	50	13	N18	18	E103	0	W	0	-0	-0	-0	-0	-0	-0	4
1744	USA	1	30	50	27	N18	18	E104	0	S	0	-0	-0	-0	-0	-0	-0	4
1745	USA	1	30	50	27	N18	0	E104	0	W	0	-0	-0	-0	-0	-0	-0	4
1746	USA	1	30	50	37	N17	45	E103	54	W	0	-0	-0	-0	-0	-0	-0	4
1747	USA	1	30	50	45	N18	0	E103	30	S	0	-0	-0	-0	-0	-0	-0	4
1748	USA	1	30	50	49	N18	18	E102	33	W	0	-0	-0	-0	-0	-0	-0	4
1749	USA	1	30	70	1	N17	15	E102	3	S	0	-0	-0	-0	-0	-0	-0	4
1750	USA	1	30	70	31	N17	30	E103	0	W	1	17451749	-0	-0	-0	-0		4
1751	USA	1	30	70	57	N17	15	E102	30	S	1	15291545	-0	-0	-0	-0		4
1549	USA	1	30	80	3	N17	15	E104	15	W	1	17471739	-0	-0	-0	-0		4
1550	USA	1	30	80	3	N17	15	E104	30	W	1	17491745	-0	-0	-0	-0		4
1551	USA	1	30	80	9	N17	0	E104	0	W	1	17391747	-0	-0	-0	-0		4

```
1553 USA    1  30   90   11 N17   0 E105 45 S 1 1744  -0  -0  -0  -0  -0        4
1554 USA    1  30   90   17 N17  30 E105 30 S 1 1747  -0  -0  -0  -0  -0        4
1555 USA    1  30   90   25 N17  30 E105 45 S 1 1546  -0  -0  -0  -0  -0        4
1556 USA    1  30   90   75 N17   0 E105 30 S 1 1547  -0  -0  -0  -0  -0        4
1557 USA    1  30   90   79 N17  52 E105 30 S 1 1744  -0  -0  -0  -0  -0        4
1558 USA    1  30   90   87 N17  45 E105  0 S 1 1747  -0  -0  -0  -0  -0        4
1559 USA    1  30   90  109 N18   0 E106  0 S 1 1749  -0  -0  -0  -0  -0        4


   73 .SUBSTRATA HISTORICAL DATA CARDS READ
   73  SUBSTRATA STATISTICAL DATA CARDS READ
   65  SAMPLE SEGMENT ID DATA CARDS READ
   43  CROP CALENDER DATA CARDS READ
    2  CROP CALENDER ERROR DATA CARDS READ
   73  SUBSTRATA INTERMEDIATE FILE RECORDS WRITTEN
   65  SEGMENT INTERMEDIATE FILE RECORDS WRITTEN
   44  CROP CALENDER INTERMEDIATE FILE RECORDS WRITTEN


    0   INPUT ERRORS DETECTED
```

```
 SUBSTRATA HISTORICAL FILE
 ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   10   ISUB =   89   NSEG =   0
 IDSEG =    0
  IGRP  =  2   HISTPW =    .205128+02   AREA =    .404687+04   TPWSS =    .244625+02
NAGR   =  39 NAL    =  40 DEVTPW =   .050 DEVTPM =   .500
CV     =  .100  .100  .100  .100

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =    5   ISEG = 1528   ITRIND = 1
 ITLIST = 1529   -0   -0   -0   -0   -0
 QLAT =    .331613-00   QLONG =    .181514+01   INDEX =   48   ISWH = 1

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =    5   ISEG = 1529   ITRIND = 0
 ITLIST =   -0   -0   -0   -0   -0   -0
 QLAT =    .325504-00   QLONG =    .181340+01   INDEX =   48   ISWH = 1

 CROP WINDOW FILE
 ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =    5
IPREDW =    0    0    0    0    0    0    0    0
ISEGSD =  1 ICRPEW =   0  0  0  0  0
IPREDS =   9502  9504  9511  9514  9522  9524  9528  9531
ISGSD1 =  2 ICRPES =   1  1  2  2  3


 SUBSTRATA HISTORICAL FILE
 ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =    5   NSEG =   2
 IDSEG =  1528  1529
  IGRP  =  1   HISTPW =    .205128+02   AREA =    .404687+04   TPWSS =    .168315+02
NAGR   =  39 NAL    =  40 DEVTPW =   .050 DEVTPM =   .500
CV     =  .100  .100  .100  .100

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =   15   ISEG = 1728   ITRIND = 1
 ITLIST = 1529   -0   -0   -0   -0   -0
 QLAT =    .326377-00   QLONG =    .180205+01   INDEX =   49   ISWH = 1

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =   15   ISEG = 1729   ITRIND = 1
 ITLIST = 1739 1529   -0   -0   -0   -0
 QLAT =    .326377-00   QLONG =    .180729+01   INDEX =   48   ISWH = 0

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =   15   ISEG = 1730   ITRIND = 1
 ITLIST = 1529   -0   -0   -0   -0   -0
 QLAT =    .322886-00   QLONG =    .180205+01   INDEX =   34   ISWH = 1

 SEGMENT ID FILE
ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =   15   ISEG = 1731   ITRIND = 1
 ITLIST = 1739   -0   -0   -0   -0   -0
 QLAT =    .322886-00   QLONG =    .180642+01   INDEX =   34   ISWH = 0

 CROP WINDOW FILE
 ICTRY =USA    IREG =   1   IZONE =  30   ISTRAT =   20   ISUB =   15
IPREDW =   9502  9504  9511  9514  9522  9524  9528  9531
ISEGSD =  1 ICRPEW =   2  2  3  3  4
IPREDS =   9504  9506  9513  9516  9524  9526  9530  9533
ISGSD1 =  2 ICRPES =   1  1  2  2  3
```

3.3.5 File Requirements

Input:	SHISTD	-	Substrata Historical Data Cards
	SSTATD	-	Substrata Statistical Data Cards
	SEGIDD	-	Sample Segment Location Data Cards
	SEGCWD	-	Sample Substrata Crop Calendar Data Cards
	CRPERR	-	Crop Calendar Error Data Cards
	INDMAT	-	Index Matrix Location File
Output:	SEGID	-	Crop Calendar (Window) File
	SUBHST	-	Substrata Historical File

Intermediate:

CRPINT	-	Crop Calendar Intermediate File
SUBINT	-	Substrata Intermediate File
SEGINT	-	Segment Intermediate File

3.3.6 Error and Recovery

3.3.6.1 General

The program will attempt to find as many sources of error during input card processing as possible. The program will continue checking for further input errors upon detecting any input error. Processing will continue if possible if recovery from errors may be overcome.

3.3.6.2 Input Data Errors

- Compatibility checks (Do the country, region zone, strata, and substrata agree between the substrata statistical data and between the sample segment ID data and the crop window data?)
- Checks for non-overlapping windows
- Sequence checking of the card data
- Input/output data limit checks (Table 3.3-4)
- Training priority segment NNNN is either not a training segment or nonexistant-fatal.
- A Group 1 substrata does not have at least 1 sample segment. Nonfatal
- A strata with at least 1 group 2 substrata does not have a sample segment in any group 2 substrata . Nonfatal
- A group 3 substrata has 1 or more sample segments . Fatal

Table 3.3-4. LUMP Input Data Limit Checks

Parameters	Range
Substrata Area	> 0
Historical W	0 to 10^{+2}
Deviation of True	-9.999 to 9.999
Yr-to-Yr CV of True PW	0 to 9.999
Within County CV of True PW	0 to 9.999
Within County CV of True PM	0 to 9.999
Multi Year CV of Standard Dev	0 to 9.999
Ratio of PM to PW	0 to 9.999
Spring/Winter Wheat Indicator	S or W
Segment Latitude	-65° to +65°
Crop Window Dates	
Year	64 - 99
Month	1 - 12
Day	1 - 31
Grid Index	1 - 16000
DELTWE, DELWET	-1.0, +1.0

- Region xxx zone xxx strata xxxx substrata xxxx beta distribution function could not converge on a solution
- Region xxx zone xxx strata xxxx substrata xxxx beta function reset ----- value since not between 0 and 1. Either ------ or ------ have bad values
- Region xxx zone xxx strata xxxx substrata xxxx segment xxxx. No crop calendar data available for segment intermediate file record, record skipped
- Region xxx zone xxx strata xxxx substrata xxxx segment xxxx. No weather grid index no. could be found. The segment record is skipped.

3.3.6.3 Error Messages

Card Field Errors

For any error on a card the card image is printed prior to the message:

1. Inconsistent substrata historical and statistical data
2. Inconsistent Crop Window Error Data and Crop Window Data
3. Substrata area must be positive
4. Historical proportion of wheat must be non-negative
5. DEVTPW must be less than 9.999 in magnitude
6. COEFF, if variations must be between 0.0 and 9.999
7. DEVTPM must be between 0.0 and 9.999
8. Latitude must be less than or equal to 65.0 deg.
9. Longitude must be between -180 and 180 deg.
10. Spring/winter wheat indicator must be W or S
11. CV4 must be between 0.0 and 9.999
12. Year must be greater than 64
13. Month must be between 1 and 12
14. Day must be between 1 and 31
15. Overlapping crop window
16. Group no must be equal to 1, 2 or 3
17. Delta errors in bio window prediction dates are not between -1 and +1
18. Segment specified as ordinary must have a training segment priority list.
19. Neither NAGR or NAL can be zero.

3.4 SEE

Operational Assumptions

- One case may be run at one time.
- Only one country may be processed in a case.
- The three data card sets must be on separate input files and in sort as follows:
  The major sort field is listed first.

  1. YES error data, set 5

     Country, region, zone, strata and card sequence number

  2. CAMS error data set 6

     Country, region, zone, strata, substrata, segment and card sequence number

  3. Signature extension set 7

     Country, region, zone and card sequence number

- All cards in a group with the same ID must be present even though a card may contain only blank data entries.
- The program will require less than 20,000 words decimal of storage in the CPU of the UNIVAC.
- The program will run only if the specified substrata historical file is present.
- Except in the case of an input card set being out of sort, the program will continue checking for field errors and for mismatches vs. the substrata historical file. A fatal error will stop output files from being written.
- Input data groups for which there is no ID match on the substrata historical file are considered to be extra data and are not written out on the output files.

- IDFRS and IDTOS specify ID limits for which certain errors are considered to be fatal. If a normally fatal error occurs on a card group outside these limits, it will be considered to be non-fatal.
- A negative non-zero entry in any card input unit designator IYESR, ISIGEX or ICAMER indicates that that data is not to be read or processed and the corresponding output file will not be created.
- The United States must be assigned the symbol "USA " and Canada must be assigned the symbol "CAND".
- CAMS error data and signature extension data cards do not have to be entered at all levels. But there must be a YES data set for each strata entered since the yield value is unique for each strata.

3.4.1 Input Card Data

3.4.1.1 Input Data Description

See Table 3.4-1.

3.4.1.2 Card Formats

See Tables 3.4-2 and 3.4-3.

Table 3.4-1. SEE Input Data Description

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
ICASE	-	1	-	1-9999	-	Case no. to be assigned to identify the three output files.
ILIST	-	1	-	0-2	-	List option to list all input data cards or only those in error and all output file records. = 0 list cards in error = 1 list all input data cards = 2 list all input data cards and all output file records
IDFRS	-	2	0, 0		-	Specifies ID of starting zone for which errors are to be considered fatal. 1st item region, 2nd - zone. Blank or 0 entry means entire ID range is active.
IDTOS	-	2	0, 0		-	Specifies ID of ending zone for which errors are considered to be fatal. 1st item is reg., 2nd - zone.
IYESU	-	1	1	-	-	File unit no. for YES input card data. Minus value means not to read or process this data.
ISIGEX	-	1	2	-	-	File unit no. for signature extension input card data. Minus value means not to read or process this data.
ICAMER	-	1	4	-	-	File unit no. for CAMS error input card data. Minus value means not to read or process.
ICSESH	-	1	-	-	-	Zero or blank means not to check on case no. of input substrata historical file.
ICTRY	-	1	-	-	-	Four character country name (i.e., USA , USSR).

Table 3.4-1. SEE Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
IREG	-	1	-	0-999	-	Region no.
IZONE	-	1	-	0-999	-	Zone no.
ISTRAT	-	1	-	0-9999	-	Strata no.
ISUB	-	1	-	0-9999	-	Substrata no.
ISEG	-	1	-	0-9999	-	Segment no.
YIELDI	Y_I	1	-	0-99.99	Quin/ hectar	True yield of stratum (for USA , and CAND - bushels/acre.
IERDTE	-	6x3	0	See error checks	Yr, Mon, Day	Year, month and day for error truncation. If 1st value is 0, then there is no bias or std. dev. data. Any other 0 value terminates data entries.
BIASYI	B_{YI_i}	6	0	$\pm$99.9	Quin/ hectar	Bias error of yield. One value for each $\neq 0$ value of IERDTE for USA , CAND - bushels/ acre.
SIGYII	σ_{YI_i}	6	0	0-99.99	Quin/ hectar	Standard deviation of yield error. One value for each $\neq 0$ value of IERDTE for USA , CAND - bushels/acre.
PWW	$P(W/W)_i$	4	0	0-1	-	Nominal frequency of labeling wheat given pure wheat pixels (conditional prob.). One for each window.
PWM	$P(W/M)_i$	4	0	0-1	-	Nominal frequency of labeling wheat given mixed pixels (cond. prob.). One for each window.
PWO	$P(W/O)_i$	4	0	0-1	-	Nominal frequency of labeling wheat given pure other pixels (cond. prob.). One for each window.

Table 3.4-1. SEE Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
BWW	$B(W/W)_i$	4	0	±9.999	-	Bias error in classifying pure wheat pixels. One for each window.
BWM	$B(W/M)_i$	4	0	±9.999	-	Bias error in classifying mixed pixels. One for each window.
BWO	$B(W/O)_i$	4	0	±9.999	-	Bias error in classifying other crop pixels. One for each window.
SIGWW	$\sigma(W/W)_i$	4	0	0-9.99	-	Standard deviation in classifying wheat pixels. One for each window.
SIGWM	$\sigma(W/M)_i$	4	0	0-9.99	-	Standard deviation in classifying mixed pixels. One for each window.
SIGWO	$\sigma(W/O)_i$	4	0	0-9.99	-	Standard deviation in classifying other crop pixels. One for each window.
BPW	B_{PW_i}	4	0	±9.999	-	Bias in proportion estimate (model #2). One for each window.
SIGPW	σ_{PW_i}	4	0	0-9.99	-	Standard deviation in proportion estimate (model #2).
			FOR MODEL 1 SIGNATURE EXTENSION			
B1W	B_{1W}	1	0	±9.999	-	Multiplicative bias error W/W.
B2W	B_{2W}	1	0	±9.999	-	Additive bias error W/W.
SIG1W	σ_{1iW}	6	-	0-9.99	-	Multiplicative std. dev. error (W/W). One for each training priority segment.
SIG2W	σ_{2iW}	6	-	0-9.99	-	Additive std. dev. error (W/W). One for each training priority segment.

Table 3.4-1. SEE Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
B1M	B_{1M}	1	-	±9.999	-	Multiplicative bias error (W/M).
B2M	B_{2M}	1	-	±9.999	-	Additive bias error (W/M).
SIG1M	σ_{1iM}	6	-	0-9.99	-	Multiplicative std. dev. error (W/M). One for each training priority segment.
SIG2M	σ_{2iM}	6	-	0-9.99	-	Additive std. dev. error (W/M). One for each training priority segment.
B1O	B_{1O}	1	-	±9.999	-	Multiplicative bias error (W/O).
B2O	B_{2O}	1	-	±9.999	-	Additive bias error (W/O).
SIG1O	σ_{1iO}	6	-	0-9.99	-	Multiplicative std. dev. error (W/O). One for each training priority segment.
SIG2O	σ_{2iO}	6	-	0-9.99	-	Additive std. dev. error (W/O). One for each training priority segment.
			FOR MODEL 2 SIGNATURE EXTENSION			
B1	B_1	1	-	±9.999	-	Multiplicative bias error
B2	B_2	1	-	±9.999	-	Additive bias error
SIG1	σ_{1i}	6	-	0-9.99	-	Multiplicative std. dev. error. One for each training priority segment.
SIG2	σ_{2i}	6	-	0-9.99	-	Additive std. dev. error. One for each training priority segment.
ISET	-	1	-	-	-	Card set number in column 80. 5 for YES error data. 6 for CAMS error data. 7 for signature extension data.

Table 3.4-1. SEE Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
SEQ	-	1	-	-	-	Card sequence number within card set with the same ID. Used to identify each card of a group. YES error has a 2 card group. CAMS error and sig. ext. each have 4 card groups.

Table 3.4-2. SEE Control Card

1	5	6	9	12	15	18	20	22	24
		IDFRS		IDTOS					
ICASE	ILIST	Region	Zone	Region	Zone	IYESU	ISIGEX	ICAMER	ICSESH
I4	I1	I3	I3	I3	I3	I2	I2	I2	I4

Table 3.4-3. SEE Data Cards

YES Error Data Card 1

1	5	9	12	15	19	24	30	36	42	48	54	60	79	80
X	Country	Reg	Zone	Strata	Y	Error Trunc. Date 1	Date 2	Date 3	Date 4	Date 5	Date 6		1	5
						Y M D	Y M D	Y M D	Y M D	Y M D	Y M D			
	A4	I3	I3	I4	F5.2	3I2	3I2	3I2	3I2	3I2	3I2			

YES Error Data Card 2

1	5	9	12	15	19	24	29	34	39	44	49	54	59	64	69	74	79	80
X	Country	Reg	Zone	Strata	Bias Error of Yield						Standard Error of Yield						2	5
					B_1	B_2	B_3	B_4	B_5	B_6	σ_1	σ_2	σ_3	σ_4	σ_5	σ_6		
	A4	I3	I3	I4	6F5.1						6F5.2							

Signature Extension Data Card 1

1–5	5–9	9–12	12–15	15–21	21–27	27–31	31–35	35–39	39–43	43–47	47–51	51–55	55–59	59–63	63–67	67–71	71–75	75–79
X	Country	Reg.	Zone	B_{1W}	B_{2W}	Mult. Std. Dev. Error W/W						Additive Std. Dev. Error W/W						1
						σ_{11W}	σ_{12W}	σ_{13W}	σ_{14W}	σ_{15W}	σ_{16W}	σ_{21W}	σ_{22W}	σ_{23W}	σ_{24W}	σ_{25W}	σ_{26W}	
	A4	I3	I3	F6.3	F6.3	6F4.2						6F4.2						

Signature Extension Data Card

1–5	5–9	9–12	12–15	15–21	21–27	27–31	31–35	35–39	39–43	43–47	47–51	51–55	55–59	59–63	63–67	67–71	71–75	75–79
X	Country	Reg.	Zone	B_{1M}	B_{2M}	Mult. Std. Dev. Error W/M						Additive Std. Dev. Error W/M						2
						σ_{11M}	σ_{12M}	σ_{13M}	σ_{14M}	σ_{15M}	σ_{16M}	σ_{21M}	σ_{22M}	σ_{23M}	σ_{24M}	σ_{25M}	σ_{26M}	
	A4	I3	I3	F6.3	F6.3	6F4.2						6F4.2						

Signature Extension Data Card 3

1–5	5–9	9–12	12–15	15–21	21–27	27–31	31–35	35–39	39–43	43–47	47–51	51–55	55–59	59–63	63–67	67–71	71–75	75–79
X	Country	Reg.	Zone	B_{1O}	B_{2O}	Mult. Std. Dev. Error W/O						Additive Std. Dev. Error W/O						3
						σ_{11O}	σ_{12O}	σ_{13O}	σ_{14O}	σ_{15O}	σ_{16O}	σ_{21O}	σ_{22O}	σ_{23O}	σ_{24O}	σ_{25O}	σ_{26O}	
	A4	I3	I3	F6.3	F6.3	6F4.2						6F4.2						

Signature Extension Data Card 4

1–5	5–9	9–12	12–15	15–21	21–27	27–31	31–35	35–39	39–43	43–47	47–51	51–55	55–59	59–63	63–67	67–71	71–75	75–79
X	Country	Reg.	Zone	B_1	B_2	Multiplicative Std. Dev. Error						Additive Std. Dev. Error						4
						σ_{11}	σ_{12}	σ_{13}	σ_{14}	σ_{15}	σ_{16}	σ_{21}	σ_{22}	σ_{23}	σ_{24}	σ_{25}	σ_{26}	
	A4	I3	I3	F6.3	F6.3	6F4.2						6F4.2						

Table 3.4-3. SEE Data Cards (cont'd)

CAMS Error Data Card 1 for Pure Wheat Pixels

5	9	12	15	19	23	27	31	35	39	45	51	57	63	67	71	75	79	80
Seg-ment	Country	Reg.	Zone	Strata	Sub-strata	Nominal Freq. Label Wht.				Bias Error in Classifying Wheat				Std. Dev. Classify Wht.					
						$P(W/W)_1$	$P(W/W)_2$	$P(W/W)_3$	$P(W/W)_4$	$B(W/W)_1$	$B(W/W)_2$	$B(W/W)_3$	$B(W/W)_4$	$\sigma(W/W)_1$	$\sigma(W/W)_2$	$\sigma(W/W)_3$	$\sigma(W/W)_4$	1	
I4	A4	I3	I3	I4	I4	4F4.2				4F6.3				4F4.2					

CAMS Error Data Card 2 for Mixed Pixels

5	9	12	15	19	23	27	31	35	39	45	51	57	63	67	71	75	79	80
Seg-ment	Country	Reg.	Zone	Strata	Sub-strata	Nominal Freq. Label Wht.				Bias Error in Classifying Wheat				Std. Dev. Classify Wht.					
						$P(W/M)_1$	$P(W/M)_2$	$P(W/M)_3$	$P(W/M)_4$	$B(W/M)_1$	$B(W/M)_2$	$B(W/M)_3$	$B(W/M)_4$	$\sigma(W/M)_1$	$\sigma(W/M)_2$	$\sigma(W/M)_3$	$\sigma(W/M)_4$	2	
I4	A4	I3	I3	I4	I4	4F4.2				4F6.3				4F4.2					

CAMS Error Data Card 3 for Other Pixels

5	9	12	15	19	23	27	31	35	39	45	51	57	63	67	71	75	79	80
Seg-ment	Country	Reg.	Zone	Strata	Sub-strata	Nominal Freq. Label Wht.				Bias Error in Classifying Wheat				Std. Dev. Classify Wht.					
						$P(W/O)_1$	$P(W/O)_2$	$P(W/O)_3$	$P(W/O)_4$	$B(W/O)_1$	$B(W/O)_2$	$B(W/O)_3$	$B(W/O)_4$	$\sigma(W/O)_1$	$\sigma(W/O)_2$	$\sigma(W/O)_3$	$\sigma(W/O)_4$	3	
I4	A4	I3	I3	I4	I4	4F4.2				4F6.3				4F4.2					

CAMS Error Data Card 4

5	9	12	15	19	23	27	31	35	39	45	51	57	63	79	80
Seg-ment	Country	Reg.	Zone	Strata	Sub-strata	Std. Dev. Proportion Est.				Bias in Proportion Estimate					
						$\sigma(P/W)_1$	$\sigma(P/W)_2$	$\sigma(P/W)_3$	$\sigma(P/W)_4$	$B(P/W)_1$	$B(P/W)_2$	$B(P/W)_3$	$B(P/W)_4$	4	
I4	A4	I3	I3	I4	I4	4F4.2				4F6.3					

Table 3.4-3. SEE Data Cards (cont'd)

3.4.1.3 Deck Setup

The input card data stream will have one card, the program control card.

The YES data will be on the file specified in IYESU (Unit 1 is assumed if this entry is 0).

The CAMS error data will be on the file specified in ICAMER (Unit 4 is assumed if this entry is 0).

The signature extension data will be on the file specified in ISIGEX (Unit 2 is assumed if this entry is 0).

In the case of the signature extension and CAMS error data cards, if the data is constant for a particular ID level such as zone, only one card group may be filled out for that zone and all ID levels below zone are left blank.

3.4.1.4 Rules for Entering Data Items on Cards

3.4.1.4.1 General

1. Integers must be right justified.
2. Alphanumeric data must be left justified.
3. F format numbers must have the decimal point present, i.e., F6.2 - NNN.NN. However, the user may override the specified field format as long as the total field width is not exceeded.
4. Except for IYESU, ISIGEX and ICAMER, all other nominal values are zero.

3.4.1.4.2 Rules for Inputting Specific Fields

- ICSESH must match the case no. of the substrata historical file.
- If IDFRS and IDTOS are left blank, then it will be assumed that the occurrence of any fatal error will terminate the writing of that output file with which it is associated.

- If the first entry of IERDTE data is 0 or blank on card 1 of a YES data group, then the card 2 data is ignored (the card 2 must be present but can be blank except for ID). The IERDTE data and card 2 data from the last non-zero IERDTE data group is used to obtain values for the current group.
- All standard deviation, bias and frequency data items are checked to be within valid ranges. See Section 3.4.6.2 for specific field checks.

3.4.2 Sample Card Data

		IDFRS		IDTOS					
ICASE	ILIST	REG	ZONE	REG	ZONE	IYESU	ISTGEX	ICAMR	ICSESH
2	2	1	45	1	50	=0	=0	=0	1

3.4.3 Output Report Definitions

There are no normal report data items.

3.4.4 Sample Pages from Output Reports

The following page is a sample of a card image printout and file contents dumps as controlled by ILIST.

```
                                        YES DATA GROUP
          USA   1   4  2010.207512 176 1 176 2 176 3 176 31576 415                    15
                                .8    .6    .4    .2    .0   -.2 5.00 4.00 3.00 2.00 1.00  .0025
                                        YESERR FILE
 ICTRY = USA  IREG =   1 IZONE =   4 ISTRAT =  20
 Y =  6.86 (ITRUTE(I),BIASY(I),SIGYIE(I),I=1,6) =
  9465    .5  3.36  9496    .4  2.69  9527    .3  2.02  9556    .1  1.35  9570    .0   .67  9601   -.1   .00

                                        CAMS DATA GROUP
          -0USA   1   4   20  -01.00 .90 .801.00  .000  .000  .000  .000 .10 .10 .10 .1016
                              1.00 .70 .50 .50  .000  .000  .000  .000 .10 .10 .10 .1026
                              1.00 .50 .30 .00  .000  .000  .000  .000 .10 .10 .10 .1036
                               .30 .20 .10 .00 -.100 -.050 -.000 -.000                46
 ICTRY USA  IREG   1 IZONE   4 ISTRAT  20 ISUB   -0 ISEG    0

*** THE CAMERR INPUT DATA GROUP DOES NOT MATCH WITH SUBHST FILE AND IS EXTRA DATA

                                        YES DATA GROUP
          USA   1   4  5010.507512 176 1 176 2 176 3 176 31576 415                    15
                               .5    .3    .1   -.1   -.3   -.5 5.00 4.00 3.00 2.00 1.00  .0025
                                        YESERR FILE
 ICTRY = USA  IREG =   1 IZONE =   4 ISTRAT =  50
 Y =  7.06 (ITRUTE(I),BIASY(I),SIGYIE(I),I=1,6) =
  9465    .3  3.36  9496    .2  2.69  9527    .1  2.02  9556   -.1  1.35  9570   -.2   .67  9601   -.3   .00

                                        CAMS DATA GROUP
          -0USA   1   4   50  -01.00 .90 .801.00  .000  .000  .000  .000 .10 .10 .10 .1016
                              1.00 .70 .50 .50  .000  .000  .000  .000 .10 .10 .10 .1026
                              1.00 .50 .30 .00  .000  .000  .000  .000 .10 .10 .10 .1036
                               .30 .20 .10 .00 -.100 -.050 -.000 -.000                46

                                        CAMERR FILE
 ICTRY = USA  IREG =   1 IZONE =   4 ISTRAT =   50 ISUB =   13 ISEG = 1002
 (PWW(I),PWH(I),PWO(I),BWW(I),SIGWW(I),BWH(I),SIGWH(I),BWO(I),SIGWO(I),BPW(I),SIGPW(I),I=1,4) =
 1.00 1.00 1.00   .000   .100   .000   .10   .00   .10  -.100   .30
  .90  .70  .50   .000   .100   .000   .10   .00   .10  -.050   .20
  .80  .50  .30   .000   .100   .000   .10   .00   .10  -.000   .10
 1.00  .50  .00   .000   .100   .000   .10   .00   .10  -.000   .00

                                        CAMERR FILE
 ICTRY = USA  IREG =   1 IZONE =   4 ISTRAT =   50 ISUB =   21 ISEG = 1066
 (PWW(I),PWH(I),PWO(I),BWW(I),SIGWW(I),BWH(I),SIGWH(I),BWO(I),SIGWO(I),BPW(I),SIGPW(I),I=1,4) =
 1.00 1.00 1.00   .000   .100   .000   .10   .00   .10  -.100   .30
  .90  .70  .50   .000   .100   .000   .10   .00   .10  -.050   .20
  .80  .50  .30   .000   .100   .000   .10   .00   .10  -.000   .10
 1.00  .50  .00   .000   .100   .000   .10   .00   .10  -.000   .00

                                        YES DATA GROUP
          USA   1   4  7010.707512 176 1 176 2 176 3 176 31576 415                    15
                               .3    .1   -.1   -.3   -.5   -.7 5.00 4.00 3.00 2.00 1.00  .0025
                                        YESERR FILE
 ICTRY = USA  IREG =   1 IZONE =   4 ISTRAT =  70
 Y =  7.20 (ITRUTE(I),BIASY(I),SIGYIE(I),I=1,6) =
  9465    .2  3.36  9496    .1  2.69  9527   -.1  2.02  9556   -.2  1.35  9570   -.3   .67  9601   -.5   .00

                                        CAMS DATA GROUP
```

3.4.5 File Requirements

Input:	YESECD	-	Yes Error Data Cards
	CAMECD	-	CAMS Error Data Cards
	SIGECD	-	Signature Extension Data Cards
	SUBHST	-	Substrata Historical File
Output:	CAMERR	-	CAMS Error Data File
	SIGEXT	-	Signature Extension Data File
	YESERR	-	YES Error Model File

3.4.6 Error and Recovery

With the exception of the wrong substrata historical file being mounted or any data out of sequence, the program will continue to check for all types of errors even though the writing of a given output file has stopped. There are three categories of errors:

1. Fatal with immediate termination - level 3.
2. Fatal for a given input data type - error checking continues but the writing of the corresponding output file stops - level 2.
3. Nonfatal - normal processing continues - level 1. The card image of the card with field errors or card ID which triggered a general error will be printed prior to the message. The error checks, messages and fatal status are given in Sections 3.4.6.1 and 3.4.6.2 below.

3.4.6.1 General

Level 3

Code No.

1. A check is made that the correct substrata historical file has been mounted as specified by ICSESH.

   Message:

   EITHER THE SUBSTRATA HISTORICAL FILE HAS NOT BEEN MOUNTED OR IT HAS THE WRONG CASE NO. PROCESSING IS TERMINATED.

2. A check on sequence is made from country down to the card sequence no. for each active card input set. In addition, a missing sequence no. in a card group with the same ID will cause the same action to be taken.

Message:

THE ------ INPUT DATA SET IS OUT OF ORDER. PROCESSING IS TERMINATED.

3. A check is made to make sure the ID in IDTOS is ≥ the ID in IDFRS.

Message:

ID IN IDTOS IS NOT GREATER OR = TO IDFRS

The following errors are level 2 if the error occurs when the current ID is in the range specified by IDFRS and IDTOS. Otherwise, it is a level 1 error.

10. A check is made to make sure that each SUBHST record has a corresponding record for each of the active input card sets for YES and Sig. Ext. This situation will only be considered an error in case of Sig. Ext. input if there is at least one segment in the SUBHST record.

Message:

Optional line
LEVEL 2 - WRITING OF ------ FILE TERMINATED
ICTRY ---- IREG ---- IZONE ---- ISTRAT ---- ISUB ----
------ INPUT DATA SET DOES NOT HAVE A RECORD WHICH CORRESPONDS TO SUBHST ID.

11. A check is made to make sure that for each record in SUBHST with one or more sample segments there is a CAMS input card group for each segment.

Message:

ICTRY ---- IREG --- IZONE --- ISTRAT ---- ISUB ----
CAMS INPUT DATA SET DOES NOT EXIST FOR SEGMENT ----
IN SUBHST RECORD.

Level 1 Error
Code No.

15. A check is made to see if an extra input card group has been input with no match on the SUBHST file.

Message:

THE ------ INPUT GROUP DOES NOT MATCH WITH SUBHST FILE AND IS EXTRA DATA

3.4.6.2 Card Field Errors

The occurrence of any of these errors is level 2 if the error occurs when the current ID is in the range specified by IDFRS and IDTOS. Otherwise, it is considered to be a level 1 error.

Code No.

20. A check is made to make sure the error truncation dates in IERDTE on YES card 1 are in ascending order (if not all 0).

    Message:

    IERDTE ARRAY HAS DATES NOT IN ASCENDING ORDER

21. A check is made to make sure YIELDI on YES card 1 is between 0 and 99.99.

    Message:

    YIELDI IS NOT BETWEEN 0 AND 99.99

22. A check is made to make sure that BIASYI on YES card 2 is between -99.9 and +99.9.

    Message:

    ABSOLUTE VALUE OF BIASYI IS NOT LESS THAN 99.9

23. A check is made to make sure that SIGYII on YES card 2 is between 0 and +99.9.

    Message:

    SIGYII IS NOT BETWEEN 0 AND 99.9

24. A check is made to make sure that the P(W/i) data for a CAMS card group is between 0 and 1.

    Message:

    PW- IS NOT BETWEEN 0 AND 1

25. A check is made to make certain that B(W/i) and B_{PW} for a CAMS card group is between -9.999 and +9.999.

Message:

ABSOLUTE VALUE OF BW- OR BPW IS NOT LESS THAN 9.999

Code No.

26. A check is made to make certain that σ_{PW} for a CAMS card group is between 0 and 9.99.

Message:

SIGW- OR SIGPW IS NOT BETWEEN 0 AND 9.99

27. A check is made to make sure that B_{1i} and B_{2i} data on the signature extension card group is between -9.999 and +9.999.

Message:

ABSOLUTE VALUE OF B1- OR B2- IS NOT LESS THAN 9.999

28. A check is made to be sure that σ_{1i} or σ_{2i} data on the signature extension card group is between 0 and 9.99.

Message:

SIG1- OR SIG2- IS NOT BETWEEN 0 AND 9.99

29. A check is made to make sure the dates in IERDTE are in range. Year must be greater than 64, month must be between 1 and 12 and day must be between 1 and 31.

Message:

IERDTE ARRAY HAS A BAD YEAR, MONTH OR DAY NUMBER

3.5 SAGE

Operational Assumptions

- A maximum of 426 days can be specified in NODAY--the number of days in the run.
- It is assumed that only 1 year of data, starting January 1st, is to be generated on the weather data file (366 days).
- The use of the weather file will be such that the look-up date will be determined modulo 1 year, i.e., given a run day of 400, then the look-up day will be 400 - 366 + 1 = 35.
- Only 1 case is run at a time.
- Only 1 country may be run at a time.
- The segment reference data file and the weather file are re-generated each time the program is run. There is no update capability.
- A maximum of 150 acquisitions for any one segment is allowed.

3.5.1 Input Card Data

3.5.1.1 Input Data Description

See Table 3.5-1.

3.5.1.2 Card Formats

"SAGE" is punched in card columns 75-78 of all cards. A sequence number is punched in card columns 79-80.

See Table 3.5-2 for card format.

Table 3.5-1. SAGE Input Data Description

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
IHEAD	-	18	Blanks	-	-	72 character case header which prints out at the top of every page.
ICASE	-	1	0	0-9999	-	4 digit case no. to identify the printed output and the segment reference data file.
ICSESW	-	1	0	0-9999	-	Case number identifying the swath table and reference files.
ICSESG	-	1	0	0-9999	-	Case number identifying the segment ID file.
ISTIME	-	3	0	-	-	ISTIME(1) - (Year - 1900) ISTIME(2) - month no. ISTIME(3) - day no. Run start date
NDAYS	-	1	426	1-426	Days	No. of days to process in the run.
IOPT	-	1	0	0-2	-	Program run option. 0 - run sage only 1 - run weather file generation utility only 2 - run both the utility and SAGE
IVEH	-	2		0-2	-	List of vehicle numbers to process in this run.
IREPT	-	1	F	T or F	-	Flag to indicate whether access report is to be produced. T - yes, F - no.
DECR	-	1	0	0-100	Kilom.	Swath decrement
RAND	-	1	1.0	-	-	Random no. seed used to obtain daily weather data. Must be odd integer.
IGRDN	-	1	1600	1-16000	-	No. of grid points to be written on the weather file (debug only)

Table 3.5-1. SAGE Input Data Description (cont'd)

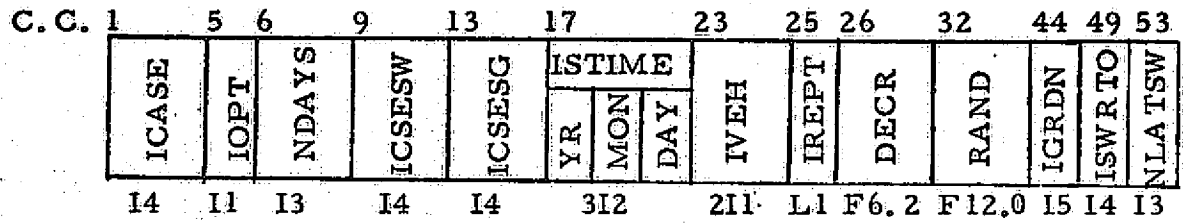
Name	Symbol	Dimension	Nominal Value	Range	Units	Description
SWRTO*	-	1	1101	4-1101	-	The number of records written on the swath table file. This is equal to (NO OF DAYS FOR EACH VEHICLE) + 2 + NO OF VEHICLES
LATSW	-	1	100	1-100	-	The number of latitude points written on the swath table record

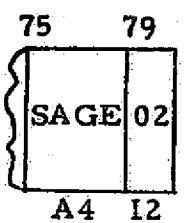
*Not needed for UNIVAC

Figure 3.5-2. SAGE Data Card Formats

Header Card

The header information is entered in C.C. 1-72; "SAGE" is entered in C.C. 75-78, and 01 is entered in C.C. 79-80.





3.5.1.3 Deck Setup

1. Header card - sequence 01
2. Data card - sequence 02

3.5.1.4 Rules for Entering Data on Cards

3.5.1.4.1 General

1. Integers must be entered right justified.
2. F format numbers must have the decimal point present, i.e., F6.2 - XXX.XX.
3. The card sequence numbers in C.C. 79-80 must be present in all data cards.

3.5.1.4.2 Rules for Specific Fields

- ICSESW must match the case number on the swath reference and swath table files.
- ICSESG must match the case number on the segment ID file.
- The start time in ISTIME must not be less than the earliest vehicle start date on the swath table file. (Note, if only 1 of the vehicles is to be processed, then ISTIME will be checked against that vehicle's start time only. If ISTIME is not input, it will be assumed that the earliest vehicle start date is the run start date.
- NDAYS must be ≥ 1 and ≤ 426.
- LVEH must have entries of 0, 1 or 2.

3.5.2 Sample Card Inputs

SAGE TEST CASE FOR HANDOFF,SYS. TEST 1#35 DAY,1/1/76 START LPP SIMULATION CASE 1 PAGE 1

HEADER

SAGE TEST CASE FOR HANDOFF,SYS. TEST 1#35 DAY,1/1/76 START

ICASE	IOPT	NDAYS	ICSESW	ICSFSG	ISTIME	LVEH	IREPT	DECR	RAND	IGRON	ISWRTO	NLAISW
1	0	35	1	1	76 1 1	1 -0	1	5.00	.1000000000004001	50	91	97

3.5.3 Output Report Data Definitions

See Table 3.5-3.

3.5.4 Sample Pages from Each Output Report

See Figure 3.5-1 for Sample Segment Access Data Report.

3.5.5 File Requirements

Input:	SWATH	-	Swath Table
	SWATHR	-	Swath Reference
	SEGID	-	Segment ID File
	WEATAP	-	NASA Climatology Tape (optional)
	WEATHR	-	Weather Data File (optional)
Output:	SEGREF	-	Segment Reference File (optional)
	WEATHR	-	Weather Data File (optional)

3.5.6 Error and Recovery

3.5.6.1 General

The program will attempt to find as many errors during the input card processing as possible. The program will continue checking for further input errors upon detecting any input error. There are 2 levels of error. These are:

Level 1 - continue processing

Level 2 - job fatal

When a level 1 error occurs, the program will print an informative message and continue. When a level 2 error occurs, the program will print an informative message and return control back to the computer system.

3.5.6.2 Input Data Errors

Level 2

1. A check is made to see if ICSESW matches the case no. on the swath files. Message:

   ***ICSESW DOES NOT MATCH THE CASE NO ON THE SWATH INPUT FILES OR SWATH FILES NOT MOUNTED.

Table 3.5-3. SAGE Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
COUNTRY	-	--	--	Segment Access	4 character country designation
ACCESS COUNT	-	1-150	--	"	Current segment access count
ACQUISIT MO/DA/YR	-	--	--	"	The month, day and year the segment was accessed by a vehicle.
REV	-	1-18	--	"	The revolution of the day that the access occurred
VEH	-	1-2	--	"	The no. of the vehicle that accessed the segment
CTA		-10, +10	Deg, min, sec	"	The crosstrack angle
EL		0-90	Deg, min, sec	"	The sun elevation angle
CLOUD COVER	-	0-100	%	"	The percent of cloud cover over the earth. 0 - none, 100 - full.
ACQUISI. TIME	-	0-86400	Sec	"	The time during the day the access occurred
ALTITUDE	-	800-1800	Kilom.	"	The vehicle altitude above earth

SAGE TEST CASE FOR HANDOFF,SYS. TEST 1#35 DAY,1/1/76 START LPP SIMULATION CASE 1 PAGE 3

SEGMENT ACCESS DATA REPORT COUNTRY USA

SEGMENT 1066

ACCESS COUNT	ACQUISIT MO/DY/YR	REV	VEH	CTA	FL	CLOUD COVER	ACQUISI TIME	ALTITUDE
1	1/ 4/76	1	1	9 3 19	55 4 44	75.0	8655.	1306.
2	1/ 5/76	1	1	1 16 55	56 12 24	75.0	9068.	1302.
3	1/ 6/76	2	1	-6 29 19	37 18 58	100.0	9478.	1288.
4	1/20/76	1	1	0 58 33	37 6 53	87.5	9088.	1130.
5	1/21/76	2	1	-7 56 5	38 21 55	12.5	9495.	1116.
6	2/ 4/76	1	1	3 25 28	38 59 48	62.5	9014.	850.

Figure 3.5-1. Sample Segment Access Data Report

2. A check is made to see if ICSESG matches the case no. on the segment ID file. Message:

   ***ICSESG DOES NOT MATCH THE CASE NO. ON THE SEGMENT ID FILE OR THIS FILE HAS NOT BEEN MOUNTED.

3. A check is made to make sure that ISTIME is not less than the earliest vehicle start time as specified on the swath table file. Message:

   ***ISTIME IS LESS THAN THE EARLIEST VEHICLE START TIME IV1TIM OR IV2TIM.

4. A check is made to make sure NDAYS is between 1 and 426. Message:

   ***NDAYS IS NOT BETWEEN 1 AND 426.

5. A check is made to make sure that the vehicle no. list in IVEH is between 0 and 2 and that there is at least one NONZERO entry. Message:

   *** IVEH HAS AN ENTRY NOT BETWEEN 0 AND 2 OR DOES NOT HAVE AT LEAST 1 NONZERO ENTRY.

6. A check is made to make sure that a weather data file has been mounted. Message

   ***THE WEATHER DATA FILE HAS NOT BEEN MOUNTED.

7. A check is made to make sure that the input quantity IVEH does not specify vehicles not on the swath files. Message.

   *** IVEH LIST IS NOT COMPATIBLE WITH NVEH AS SPECIFIED ON THE SWATH FILES.

8. A check is made to make sure IGRDN is between 1 and 16000.

   ***IGRDN DOES NOT HAVE A VALUE BETWEEN 1 AND 16000.

3.5.6.3 Processing Errors

Level 1

20. A check is made while forming the acquisition list for a segment that no more than 150 acquisitions occur. Message:

***IN PROCESSING SEGMENT NNNN MORE THAN 150 ACQUISITIONS HAVE OCCURRED. NO MORE ACQUISITIONS WILL BE PROCESSED.

21. A check will be made to make sure at least 1 acquisition of a segment occurs. Message:

***IN PROCESSING SEGMENT NNNN NO VALID ACQUISITION OCCURRED.

22. A check is made to see if a segment's latitude is in the band about the equator which is not accounted for in LATNO table. Message:

***SEGMENT NNNN LATITUDE NN NN NN IS NOT IN THE LATITUDE BAND SPECIFIED BY LATNO TABLE.

23. A check is made in the weather file utility to make sure $99 \leq F_8 \leq 101$. Message.

***THE CUMULATIVE FREQUENCY DISTRIBUTION -F SUB 8 IS NOT BETWEEN 99 AND 101.

3.5.6.4 Input/Output Errors

For sequential I/O the FORTRAN system on the UNIVAC takes control and prints a message identifying the problem and will either continue processing or abandon the job. If processing continues, the system counts the number of times this error re-occurs and if it happens a certain number of times, the system will abandon the job.

For direct access I/O, the UNIVAC D.A. I/O package prints out an informative message, sets an error flag and allows processing to continue. In this program the swath table file is the only direct access file. Immediately after the informative message, the following message will print:

40. ***AN IRRECOVERABLE I/O ERROR HAS OCCURRED IN READING/WRITING A RECORD ON THE _____ FILE. THE JOB IS BEING ABANDONED.

The blanks will be filled in with 'SWATH TB', or 'WEATHER' depending on the direct access file involved.

3.6 SACS

Operational Assumptions

- All detected errors cause the program to abort and output files and reports are terminated without completion.
- Only one country may be selected for any one program run.
- Only one case of input parameters will be processed against a single segment reference data file and crop window file.
- A maximum of 426 days is allowed for the acquisition period.
- A maximum of 4 windows is allowed.
- A maximum of 25 acquisitions allowed per window for a training segment and one acquisition allowed for an ordinary segment.

3.6.1 Input Card Data

3.6.1.1 Card Input Data Quantities

Each parameter value entered via the input cards must be entered unless explicitly stated. All integers must be right justified, all hollerith fields must be left justified. Each parameter value is outlined as follows:

a. XITTL - Card 01, Columns 1 through 48. Contains the case title that is to be printed at the top of each output page.

b. IACASE - Card 02, Columns 1 through 4. Contains the integer case number that identifies the ACQUISI file and each printed output page.

c. ISCASE - Card 02, Columns 5 through 8. Contains the integer case number of the Segment Reference Data File (if 0 or blank no check on input case No. will be made).

d. IWCASE - Card 02, Columns 9 through 12. Contains the integer case number of the Crop window input file (if 0 or blank no check on input case No. will be made).

e. IPCC - Card 02, Columns 13 through 15. Contains an integer that specifies the maximum percent cloud cover to be used in selection of ACQUISI file segments. This number is expressed in tenths of a percent (e.g., 15.4% would be expressed as 154). All ACQUISI File cloud cover percents must be less than or equal to this value.

f. ISANG - Card 02, Column 16 through 19. Contains an integer that specifies the minimum degrees sun angle to be used in selection of ACQUISI file segments. This number is expressed in hundreds of degrees and ranges between 0 and 90 degrees (e.g., 12.50 degrees would be expressed as 1250). All ACQUISI file sun angles must be greater than or equal to the specified angle.

g. ICOUN - Card 02, columns 20 through 23. Contains 4 hollerith characters that identify the country to be selected.

h. IREG - Card 02, Columns 24 through 26. Contains a three digit integer that identifies the region to be selected.

i. IZONE - Card 02, Columns 27 through 29. Contains a three digit integer that identifies the zone to be selected. A zero entry allows all zones in a region to be selected.

j. Output options, Columns 30 through 31. Contain a logical flag that specifies whether the program reports are to be generated. A T specifies print the report; an F specifies don't print the report.

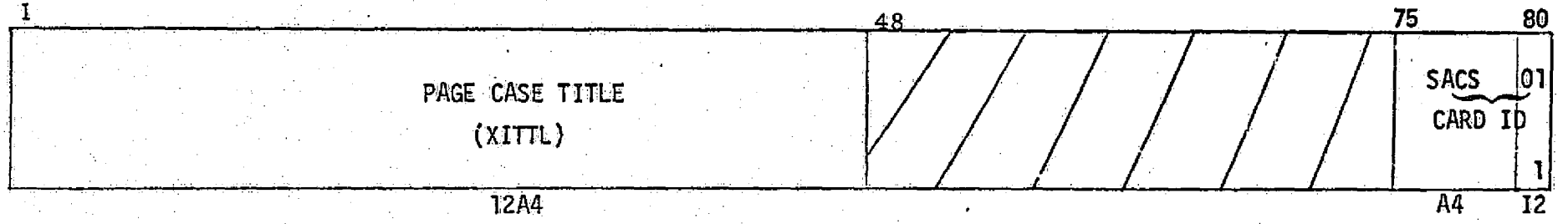
- IPRPT-30- Daily Processing Load Report
- ICRPT-31- Crop Window Report (segment acquisition)

3.6.1.2 Card Formats

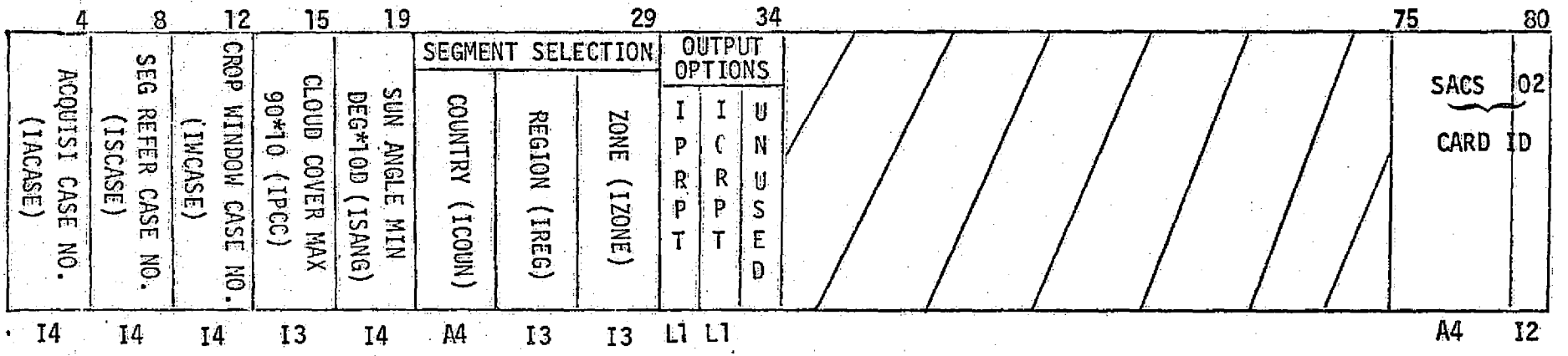
See Table 3.6-1.

Table 3.6-1. SACS Card Formats

CARD 01 - OUTPUT TITLE CARD



CARD 02 - PROGRAM OPTIONS CARD



T=YES, PRINT
F=NO, DON'T PRINT

3.6.1.3 Deck Setup

Each of the two input cards must be provided and must be supplied in card number order (see columns 79 and 80).

3.6.1.4 Rules for Entering Data on Cards

See Section 3.6.1.2.

3.6.2 Sample Card Inputs


```
CASE    1       NOMINAL CASE FOR DEBUGGING SACS CASE 1
```

HEADER

NOMINAL CASE FOR DEBUGGING SAC CASE 1

ILASE	ICSESR	ICSECW	IPCC	ISANG	ICOUN	IREG	IZONE	IPKPI	ICRST
1	1	1	900	550	USA	1	0	1	1

3.6.3 Output Report Data Definitions

See Table 3.6-2.

3.6.4 Sample Pages from Each Output Report

1. See Figure 3.6-1 for Sample Segment Acquisition Data Report.
2. See Figure 3.6-2 for Sample Daily Processing Load Report.

3.6.5 File Requirements

Input: CROPW - Crop Window File
SEGREF - Segment Reference File

Output: ACQUIS - Data Acquisition File

3.6.6 Error and Recovery

3.6.6.1 General

All fatal errors detected by this program shall result in termination of program execution. The detected errors are listed in Table 3.6-3. The processing logic is described as follows:

a. Each time an error is detected, the routine ABARF is called with the error ID.

b. The routine prints the error and forces the program to terminate execution if the error is fatal or returns control if the error is non-fatal.

Non-fatal errors shall be printed and execution continued.

Table 3.6-2. SACS Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Country	-	-	-	2.	4 character alphabetic name
Region	-	1 - 999	-	2.	Region no. within country
Zone	-	1 - 999	-	2.	Zone no. within region
S/W	-	-	-	1.	S - for spring, W - for winter
Segment	-	1 - 9999	-	1.	Segment no. ID within zone and total no. of accesses for the segment over all windows
Total access	-	1 - 25	-	1.	No. of accesses within a window for segment
Selected acquisitions	-	1 - 25	-	1.	No. of actual legal acquisitions within a window for a segment
Window	-	1 - 4	-	1.	Crop window no.
Start date	-	-	Mo., day, year	2.	Start date of the run ≡ reference start date on SEGREF file
Relative day	-	1 - 426	-	2.	Relative day no. to start date. 1 is the start date
No. acquisitions	-	1 - 9999		2.	No. of acquisitions in a given day

CASE 1 SEGMENT ACQUISITION DATA NOMINAL CASE FOR DEBUGGING SACS CASE 1 LPP SIMULATION PAGE 1

S/W	SEGMENT ID-TOTAL	WINDOW 1 TOTAL ACCESS	WINDOW 1 SELECTED ACQUISITIONS	WINDOW 2 TOTAL ACCESS	WINDOW 2 SELECTED ACQUISITIONS	WINDOW 3 TOTAL ACCESS	WINDOW 3 SELECTED ACQUISITIONS	WINDOW 4 TOTAL ACCESS	WINDOW 4 SELECTED ACQUISITIONS
W	1002- 5	1	ALL ILLEGAL	2	3 4	1	ALL ILLEGAL	0	NONE
W	1066- 6	1	ALL ILLEGAL	2	4 5	1	6	0	NONE
W	1516- 6	2	2 3	3	4 5 6	0	NONE	0	NONE
W	1317- 5	2	2 3	2	4 5	0	NONE	0	NONE
S	1725- 5	3	1	2	4	0	NONE	0	NONE
W	1726- 4	2	1	1	4	0	NONE	0	NONE
S	1727- 4	2	1	1	4	0	NONE	0	NONE
S	1528- 4	2	1	0	NONE	0	NONE	0	NONE
S	1529- 4	2	1 2	0	NONE	0	NONE	0	NONE
S	1728- 5	1	3	0	NONE	0	NONE	0	NONE
W	1729- 5	3	1	0	NONE	0	NONE	0	NONE
S	1730- 5	1	3	0	NONE	0	NONE	0	NONE
W	1731- 5	3	1	0	NONE	0	NONE	0	NONE
S	1732- 4	2	1	2	3	0	NONE	0	NONE
S	1733- 5	3	1	2	4	0	NONE	0	NONE
S	1734- 5	3	1	2	4	0	NONE	0	NONE

Figure 3.6-1. Sample Segment Acquisition Data Report

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

CASE 1 DAILY PROCESSING LOAD REPORT NOMINAL CASE FOR DEBUGGING SACS CASE 1 LPP SIMULATION PAGE 1

START DATE 1- 1-76 COUNTRY USA REGION 1 ZONE 0

RELATIVE DAY	NO. ACQUISITIONS	RELATIVE DAY	NO. ACQUISITIONS	RELATIVE DAY	NO. ACQUISITIONS	RELATIVE DAY	NO. ACQUISITIONS
1	0.	10	0.	19	0.	28	0.
2	0.	11	0.	20	4.	29	0.
3	0.	12	0.	21	12.	30	0.
4	0.	13	0.	22	8.	31	0.
5	0.	14	0.	23	10.	32	0.
6	10.	15	0.	24	5.	33	0.
7	13.	16	0.	25	0.	34	0.
8	10.	17	0.	26	0.	35	1.
9	4.	18	0.	27	0.	36	0.

Figure 3.6-2. Sample Daily Processing Load Report

Table 3.6-3. Error Messages

ERROR ID	MESSAGE
01	Cropwind file has invalid label name xxxxxxxx
02	Seg refer file has invalid label name xxxxxxxx
03	Cropwind input case xxx not equal to label case xxx
04	Seg refer input case xxx not equal to label case xxx
05	Invalid country input xxxx cropwind xxxx seg refer xxxx
06	No data selected for ACQUISI file
07	Seg refer acquisition day too large xxx, max-xxx, record=xxxxx
08	Input cards invalid or out of sequence xxxxxx (Column 75-80)
09	Input sun angle less than 0 or greater than 90.00 xxxxxx
10	Percent cloud cover less than 0 a greater than 100.0 xxxx
11	No. days in study exceeds 426
* 12	Crop window is missing a zone xxx

*Non-fatal error message

3.7 LEM

The LEM executive controls the subprograms: Segment Truth Generator, YES, CAMS and CAS.

Operational Assumptions

- Only 1 case may be run at a time.
- Only 1 country may be considered in a case.
- A maximum of 999 Monte Carlo trials may be run in a case and a maximum of 100 trials may be executed on any given run.
- A maximum of 4 crop calendar windows and 14 additional prediction points can be processed.
- A maximum of 10 regions per country can be processed.
- A maximum of 50 zones per country can be processed.
- A maximum of 20 strata per zone can be processed.
- A maximum of 325 strata per country can be processed.
- A maximum of 60 substrata per strata can be processed.
- A maximum of 3200 substrata per country can be processed.
- A maximum of 4000 segments per country can be processed.
- All control card input data will be echo printed.
- All control card input data will be checked for errors before any error will cause the processing of a case to terminate.
- In a repetitive Monte Carlo trial case, normally the individual subprogram reports will be allowed to print during the first and last trial only. An option will exist to eliminate all reports or allow printing of all reports for each trial or for just the last trial.
- All input data files will be checked for correct case numbers.
- The program will require less than 20,000 words of storage in the CPU of the UNIVAC 1110.
- The program will have a restart capability which will allow the program to continue with additional Monte Carlo iterations starting from the last iteration of the previous run.

- All files will be in country, region, zone, stratum, substratum, and segment order (to whatever level that is appropriate).

3.7.1 Input Card Data

3.7.1.1 LEM

3.7.1.1.1 Input Data Description

See Table 3.7-1.

3.7.1.1.2 Card Formats

See Table 3.7-2.

3.7.1.1.3 Deck Setup

Each of the four LEM control cards is required and they must be in card number order. In addition, control cards are always required for the CAMS module even if this module is not used. If CAMS is skipped (e.g., ICAMS = 2), then the corresponding control cards must still be included. Finally, the control cards for CAS must always be specified. The contents and format of the CAMS and CAS control cards are specified in Sections 3.7.1.2 and 3.7.1.3, respectively.

3.7.1.1.4 Rules for Entering Data on Cards

1. Integers must be right justified.
2. Alphanumeric fields should be left justified.
3. Real (i.e., floating point) fields must have the decimal point present.

Table 3.7-1. LEM Input Data Description

Card Col.	Name	Dimension	Nominal Value	Range	Description
1-60	TITLE	10	blanks	---	Problem header to be printed at the top of each output page. (format 10A6)
1-4	ICASE	1	0	0-9999	Case number
6-11	CUNTRY	1	--	---	Country (must agree with all input files).
13-15	NTRIAL	1	1	1-999 (NTRIAL-RSTART ≤ 100)	Total number of Monte Carlo iterations at the end of the current run (including previous runs if this is a restart). NTRIAL must be ≤ 100 if CAS distribution file is to be generated (i.e., if DISTFF ≠ 0 in CAS input).
17-19	RSTART	1	0	0-999	Restart Flag: = n ≠ 0 to restart after n Monte Carlo iterations, 0 if this is not a restart.
20-22	IPRINT	1	0	0-3	Iteration Print Flag (for Segment Truth Generator) 0 to print first and last iterations; 1 to print each iteration; 2 to print last iteration only; 3 to suppress printing.
24-26	STARTR	1	0	0-999	Starting region number. } Both zero or both non-zero
28-30	STARTZ	1	0	0-999	Starting zone number.
32-34	ENDR	1	0	0-999	Ending region number. } Both zero or both non-zero
36-38	ENDZ	1	0	0-999	Ending zone number.
39-41	ISTG	1	0	0-3	Segment Truth Flag: 0 to vary error statistically, 1 to hold error constant using results from the first iteration only, 2 to hold error constant using a previously generated Segment Truth file, 3 to eliminate the Segment Truth error (error is zero).
42-44	ICAMS	1	0	0-3	CAMS Error Flag: Usage is similar to the usage of the Segment Truth flag described above except that for the case in which ICAMS = 2, the CAMS Output file is used.

Table 3.7-1. LEM Input Data Description (cont'd)

Card Col.	Name	Dimension	Nominal Value	Range	Description
45-47	IYES	1	0	0-3	YES Error Flag: Usage is similar to the usage of the Segment Truth flag described above except that for the case in which IYES = 2, the YES Output file is used.
48-50	IACQ	1	0	0-1	Segment Acquisition Flag: 0 to include segment acquisition conditions, 1 to eliminate segment acquisition conditions.
51-53	ICLASS	1	0	0-2	Classification Error Flag: 0 to vary classification error in CAMS, 1 to hold the classification error constant, 2 to eliminate the classification error (set it to zero).
54-56	ISEXT	1	0	0-2	Signature Extension Error Flag: 0 to vary Signature Extension Error, 1 to hold Signature Extension Error constant, 2 to eliminate the Signature Extension Error (error is zero).
57-59	ISCC	1	0	0-2	Segment Crop Calendar Error: 0 to vary the error, 1 to hold the error constant, 2 to eliminate the error (error is zero).
60-62	ICAS2	1	0	0-1	Flag for Group II "Most Recent Non-Epoch Year" Historical Proportion of Wheat: Usage is similar to Signature Extension Error Flag described above.
63-65	ICAS3	1	0	0-1	Flag for Group III Multi-Year Proportion of Wheat: Usage is similar to Signature Extension Error Flag described above.
66-68	IPRCAM	1	0	0-3	Iteration print flag for CAMS: Usage is similar to that of IPRINT.
69-71	IPRYES	1	0	0-3	Iteration print flag for YES: Usage is similar to that of IPRINT.
72-74	IPRCAS	1	0	0-3	Iteration print flag for CAS: Usage is similar to that of IPRINT.

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Table 3.7-1. LEM Input Data Description (cont'd)

Card Col.	Name	Dimension	Nominal Value	Range	Description
1-4	ICSESG	1	0	0-9999	Case number for Segment ID file.
5-8	ICSECW	1	0	0-9999	Case number for Crop Calendar file.
9-12	ICSESH	1	0	0-9999	Case number for Substrata Historical file.
13-16	ICSECE	1	0	0-9999	Case number for CAMS Error Model file.
17-20	ICSEYM	1	0	0-9999	Case number for YES Error Model file.
21-24	ICSESE	1	0	0-9999	Case number for Signature Extension file.
25-28	ICSEAC	1	0	0-9999	Case number for Data Acquisition file.
29-32	ICSEST	1	0	0-9999	Case number for Segment Truth file.
33-36	ICSECO	1	0	0-9999	Case number for CAMS Output file.
37-40	ICSEYS	1	0	0-9999	Case number for YES Output file.
49-60	RSEED1	1	1	1-999999999999	Initial random number seed for Segment Truth Error (odd positive integer in F-format).
61-72	RSEED2	1	1	1-999999999999	Initial random number seed for Classification Error.
1-12	RSEED3	1	1	1-999999999999	Initial random number seed for Signature Extension Error.
13-24	RSEED4	1	1	1-999999999999	Initial random number seed for Segment Crop Calendar Error.
25-36	RSEED5	1	1	1-999999999999	Initial random number seed for Yield Error.
37-48	RSEED6	1	1	1-999999999999	Initial random number seed for error in Group II "Most Recent Non-Epoch Year" Historical Proportion of Wheat.
49-60	RSEED7	1	1	1-999999999999	Initial random number seed for error in Group III "Multi-Year Proportion of Wheat."

Table 3.7-2. LEM Card Formats

Card 1 Header card: Alphanumeric problem header entered in Columns 1-60. LEM is entered in Columns 75-77 and 01 in Columns 79-80.

Card 2

1	6	13	17	20	24	28	32	36	39	42	45	48	51	54	57	60	63	66	69	72	75	79
ICASE	CUNTRY	NTRIAL	RSTART	IPRINT	STARTR	STARTZ	ENDR	ENDZ	ISTG	ICAMS	IYES	IACQ	ICLASS	ISEXT	ISCC	ICAS2	ICAS3	IPRCAM	IRYES	IPRCAS	LEM	02
I4	A6	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3	I3		

Card 3

1	5	9	13	17	21	25	29	33	37	49	61	75	79
ICSESG	ICSECW	ICSESH	ICSECE	ICSEYM	ICSESE	ICSEAC	ICSEST	ICSECO	ICSEYS	RSEED1	RSEED2	LEM	03
I4	I4	I4	I4	I4	I4	I4	I4	I4	I4	D12.0	D12.0	2X	

Card 4

1	13	25	37	49	75	79
RSEED3	RSEED4	RSEED5	RSEED6	RSEED7	LEM	04
D12.0	D12.0	D12.0	D12.0	D12.0		

3.7.1.1.5 Restrictions

1. In general, the various error sources may be independently varied, held constant, or eliminated by specifying appropriate values for the input parameters ISTG, ICAMS, IYES, ICLASS, ISEXT, ISCC, ICAS2, and ICAS3. However, the user may not specify ISTG = 0 unless ICAMS is also zero. The reason for this restriction is that if ICAMS = 1 or 3 for example, the CAMS Output file will be generated on the first iteration and then used on all subsequent iterations. If ISTG were zero indicating that the Segment Truth error was to be varied, the program would be in trouble because to vary the Segment Truth error means that the results on the CAMS Output file must also be variable even if the CAMS errors are constant or zero. The way around this restriction is to specify both ICAMS = 0 and ISTG = 0 and then to specify non-zero values for ICLASS, ISEXT, and ISCC. In this manner the CAMS Output file will be written on each iteration even though the CAMS errors are really constant.

2. The variable possible combinations of the input parameters ICAMS, ISTG, IYES, ICLASS, ISEXT, ISCC, ICAS2, and ICAS3 as well as other options (CAMS classification model, multi-temporal sampling, and acquisition effects) are presented in Table 3.7-3.

3. On a restart run the input case number ICASE must agree with the case number on both of the following files which may be input to LEM:

   - CAS Cumulative Output file
   - CAS Distribution Output file

ICAMS	ISEXT	ISCC	ICLASS	Model	Multi-Temp Sampling	ISTG	IYES	ICAS2	ICAS3	IACQ
0	0, 1, 2	0, 1, 2	0, 1, 2	1, 2	0, 1	0, 1, 2, 3	0, 1, 2, 3	0, 1, 2	0, 1, 2	0, 1
1	1, 2	1, 2	1, 2	1, 2	0, 1	1, 2, 3	↓	↓	↓	0, 1
2	X	X	X	X	X	X	↓	↓	↓	X
3	X	X	X	1, 2	X	3	↓	↓	↓	0, 1

For ICAMS, ISTG, IYES

0 ⇒ vary error,

1 ⇒ hold error constant; use first iteration results,

2 ⇒ hold error constant; use previously generated file,

3 ⇒ eliminate error.

Table 3.7-3. LEM Control Options

For ISEXT, ISCC, ICLASS, ICAS2, ICAS3

0 ⇒ vary error,

1 ⇒ hold error constant,

2 ⇒ eliminate error.

For Multi-Temporal Sampling

0 ⇒ include multi-temporal sampling effects,

1 ⇒ exclude effects.

For Acquisition Effects

0 ⇒ include segment acquisition effects,

1 ⇒ eliminate segment acquisition effects.

Model = 1 or 2 for classification model 1 or 2 respectively in CAMS

4. On a restart run the CAS Cumulative Output file and the CAS Distribution Output file must always be specified. In addition, the Segment Truth file, the CAMS Output file and/or the YES Output file should be specified if the input flags ISTG, ICAMS, and/or IYES are set to 1, 2, or 3. Note, however, that if the CAMS Output file is specified, then it is not necessary to specify the Segment Truth file.

3.7.1.2 CAMS

Some data needed by CAMS is included on the LEM control card. See Section 3.7.1.1. CAMS also requires:

1. A control card, specifying options
2. A multi-temporal matrix
3. Crop calendar error coefficients

Besides the LEM card, CAMS requires a total of 13 cards, which must be in order. See Figure 3.7-4 for the deck setup.

3.7.1.2.1 List of Data Quantities and Formats

a. LEM control card, see LEM Section 3.7.1.1. Data relevant to CAMS includes:

ISEXT	Signature extension error option, = 0, 1 simulate error = 2 bypass error
ISCC	Crop calendar error option, = 0, 1 simulate = 2 bypass
ICLASS	Classification error option, = 0, 1 simulate = 2 bypass
IACQ	Acquisition file option, = 0 include file = 1 no acquisition file
ICAMS	CAMS error option, = 0, 1 simulate = 2 read previous file = 3 bypass all errors
SEED2	Random no. seed for classification error
SEED3	Random no. seed for signature extension error
SEED4	Random no. seed for crop calendar error
IPRCAM	Print flag for CAMS - this controls if a report is printed - the flag, IREP, on the CAMS control card, controls what is printed.

b. CAMS control card, see Table 3.7-4 for the format and list of quantities.

c. Multi-temporal sampling matrix. The multi-temporal sampling model describes the effect of the acquisition of a sample segment in more than one bio-window. There are 15 possible non-zero acquisition states for a sample segment. These states are shown below.

Windows included	1	2	3	4	1, 2	1, 3	1, 4	2, 3	2, 4	3, 4	1, 2, 3	1, 2, 4	1, 3, 4	2, 3, 4	1, 2, 3, 4
Group #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

The effect of acquisition conditions corresponding to any particular state is modeled by a weighting factor, M. For ease of handling, three values of M are chosen as program inputs associated with groupings of the 15 acquisition states. These values indicate no improvement ($M_1 = 1$), small improvement ($M_2 < 1$), and large improvement ($M_3 < M_2$) in the accuracy of classification of the segment with a given acquisition state over classification in the present window (last window in the state definition) alone.

The values needed are which M (M1, M2, or M3) to use for each of the 15 groupings, and the values of M2 and M3 (M1 ≡ 1). Note that by definition, for group no. 1, 2, 3, and 4, M1 = 1, and M1 = 1 > M2 > M3. See Table 3.7-5 for the data and format.

A total of eight cards are needed for the matrix, each with the above information, since the acquisition conditions depend on a. wheat type - winter or spring, b. the model - 1 or 2 (model 1 requires three cards, one for wheat, mixed, and other components; model 2 requires only one card).

If model 1 is being used, the cards for model 2 must be present but may have blank fields except for the ID (CAMS) and sequence number, and vice versa if model 2 is being used, since the

Name	Dimension	Nominal Value	Range	Units	Description
IMODEL			1-2		Flag = 1 use model 1, complex model = 2 use model 2, simple model
IMULTI		0	0-1		Flag = 0 include multi-temporal sampling error ≠ 0 bypass multi-temporal sampling error
ISIGEX		0	0-1		Flag ≠ 0 use multiplicative model of signature extension = 0 use additive model of signature extension
ISKIP		0	0-1		Flag = 0 skip if cannot correlate ordinary ≠ 0 classify as training with training segment
ITMAX			0-99	Days	Maximum no. of days between training and ordinary segment acquisition dates for successful correlation.
IREP		0	0-1		Flag = 0 include error breakdown factors in estimate report ≠ 0 print estimate report only
IWIND		4	1-4		From which window to take the probability of classifying as wheat given mixed to calculate the proportion of pure wheat pixels; if blank, defaults to window 4. This quantity is P(W/M) on the CAMERR input file; see file descriptions, Section

Input Data - CAMS Control Card Format

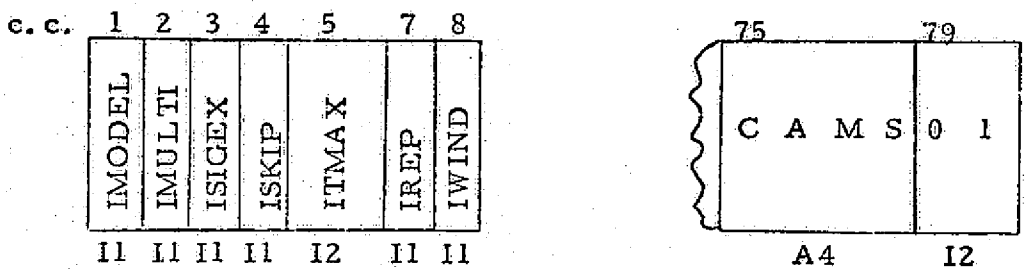


Table 3.7-4. Input Data - CAMS Control Card Quantities

Name	Dimension	Nominal Value	Range	Units	Description
IGROUP	15		1-3		Which value of M to use for each acquisition state, see 2.1.1, c., for which windows are in each state = 1 use M1 (≡ 1), no improvement = 2 use M2, small improvement = 3 use M3, large improvement Restriction: IGROUP(1), IGROUP(2), IGROUP(3) and IGROUP(4) are always = 1, by definition, and so need not be inputted.
M2			0.0<M2<1.0		Value of M2, small improvement
M3			0.0<M3<1.0		Value of M3, large improvement Restriction: M3 < M2 < 1, by definition.
ISEQ			2-9		Sequence no. - the matrix requires eight cards, each with the same format. See Deck-Setup, Figure 4, for the order and description.

Input Data - Multi-Temporal Matrix Format

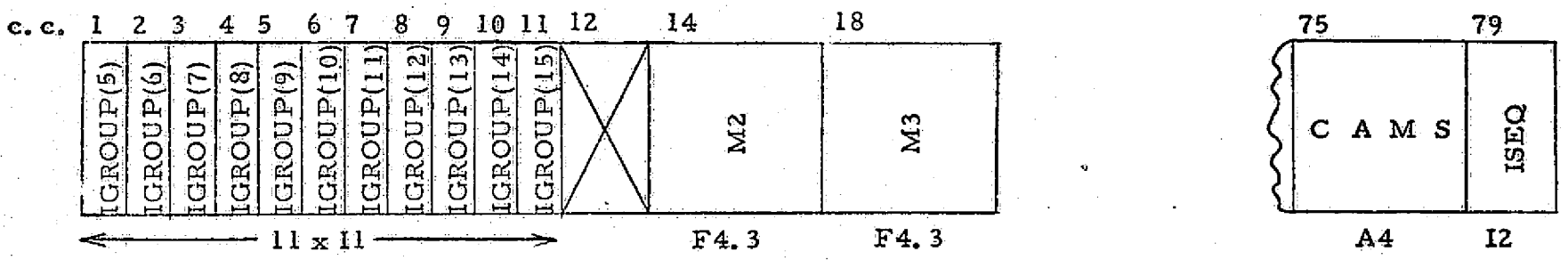


Table 3.7-5. Input Data - Multi-Temporal Matrix Quantities

values are not used. If data for both winter and spring is not available, the data may be left blank (except id and sequence number), but the cards must be present, and if CAMS tries to use the missing data, an error will be reported. If the multi-temporal error bypass is specified (IMULTI 1), then all the cards must be present but all the data but the id and sequence number may be left blank.

d. Crop calendar coefficients. The effect of crop calendar errors on segment classification, particularly in an analytic sense, is not well established at this time. For this reason, a simple generic model was chosen to represent this effect. This model generates a bias (B) and standard deviation (σ) from a quadratic function with user input coefficients.

$$B = G_1 (\Delta t) + G_2 (\Delta t)^2$$

$$\sigma = H_1 (\Delta t) + H_2 (\Delta t)^2$$

The value of the coefficients are to be determined from off-line analysis, curve fitting, etc., to represent the observed effects.

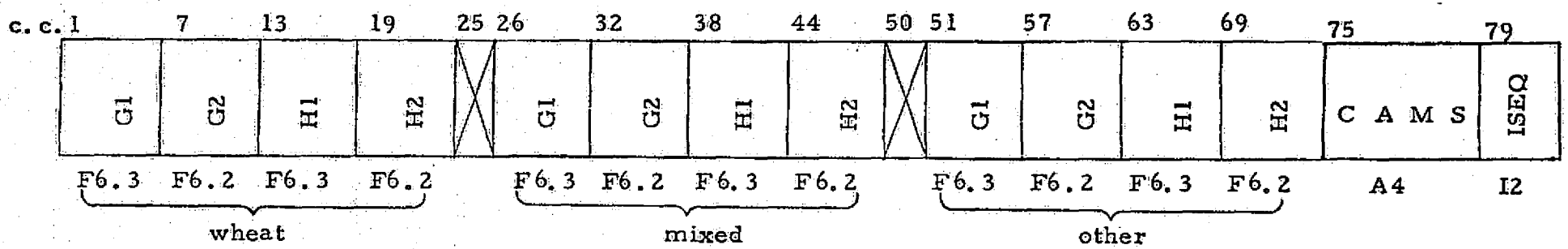
The values for G1, G2, H1, and H2 are needed. See Table 3.7-6 for a description of the quantities and format. Model 1 requires these four values for the three components, wheat, mixed, and other, a total of 12 values. Model 2 requires only the four values, since the mixed crop effect is not present. Since these values may be different for winter and spring wheat, two sets must be inputted. Thus, four cards are always needed:

1. Spring wheat - model 1 - 3x4 values
2. Spring wheat - model 2 - 4 values
3. Winter wheat - model 1 - 3x4 values
4. Winter wheat - model 2 - 4 values

Name	Dimension	Nominal Value	Range	Units	Description
G1			±9.999		Crop calendar error coefficient
G2			±99.99		Crop calendar error coefficient
H1			±9.999		Crop calendar error coefficient
H2			±99.99		Crop calendar error coefficient
ISEQ			10-13		Sequence number - the calendar requires four cards. See Deck Setup, Figure 4.

Input Data - Crop Calendar Format

Model 1:



Model 2:

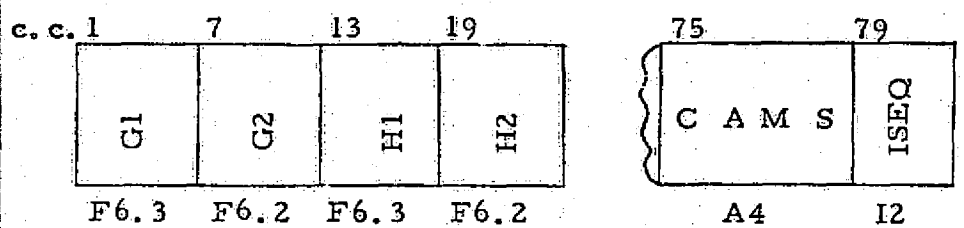


Table 3.7-6. Input Data - Crop Calendar Coefficients Quantities

If model 1 is used, the cards for model 2 must be present but may have blank fields except for the ID, CAMS, and sequence number, and vice versa for model 2. If data for both winter and spring is not available, the data may be left blank except for ID and sequence number, but the cards must be present, and if CAMS needs the missing data, an error will be reported. If the crop calendar error bypass is specified (ISCC=2), then all the cards must still be present, but all the ID and sequence number fields may be left blank.

3.7.1.2.2 Deck Setup

See Figure 3.7-1. CAMS requires 13 card inputs.

3.7.1.2.3 Rules for Entering Data

See Section 3.7.1.1 for general rules for entering data.

3.7.1.3 CAS

3.7.1.3.1 List of Data Quantities

See Table 3.7-7.

3.7.1.3.2 Card Formats

"CAS" is entered in Columns 75-77 of each control card, and a sequence number is entered in Columns 79-80. See Table 3.7-8.

3.7.1.3.3 Deck Setup

Each of the three CAS control cards is required (even if only seven or less prediction points are specified), and they must be in the proper order. Furthermore, the CAS control cards must follow the LEM control cards and the CAMS control cards as specified in Section 3.7.1.1.3.

3.7.1.3.4 Rules for Entering Data on Cards

1. Integers must be right justified.
2. The prediction dates must be entered in the format

   7 (3I2, 1X)

   with a maximum of seven dates per card.

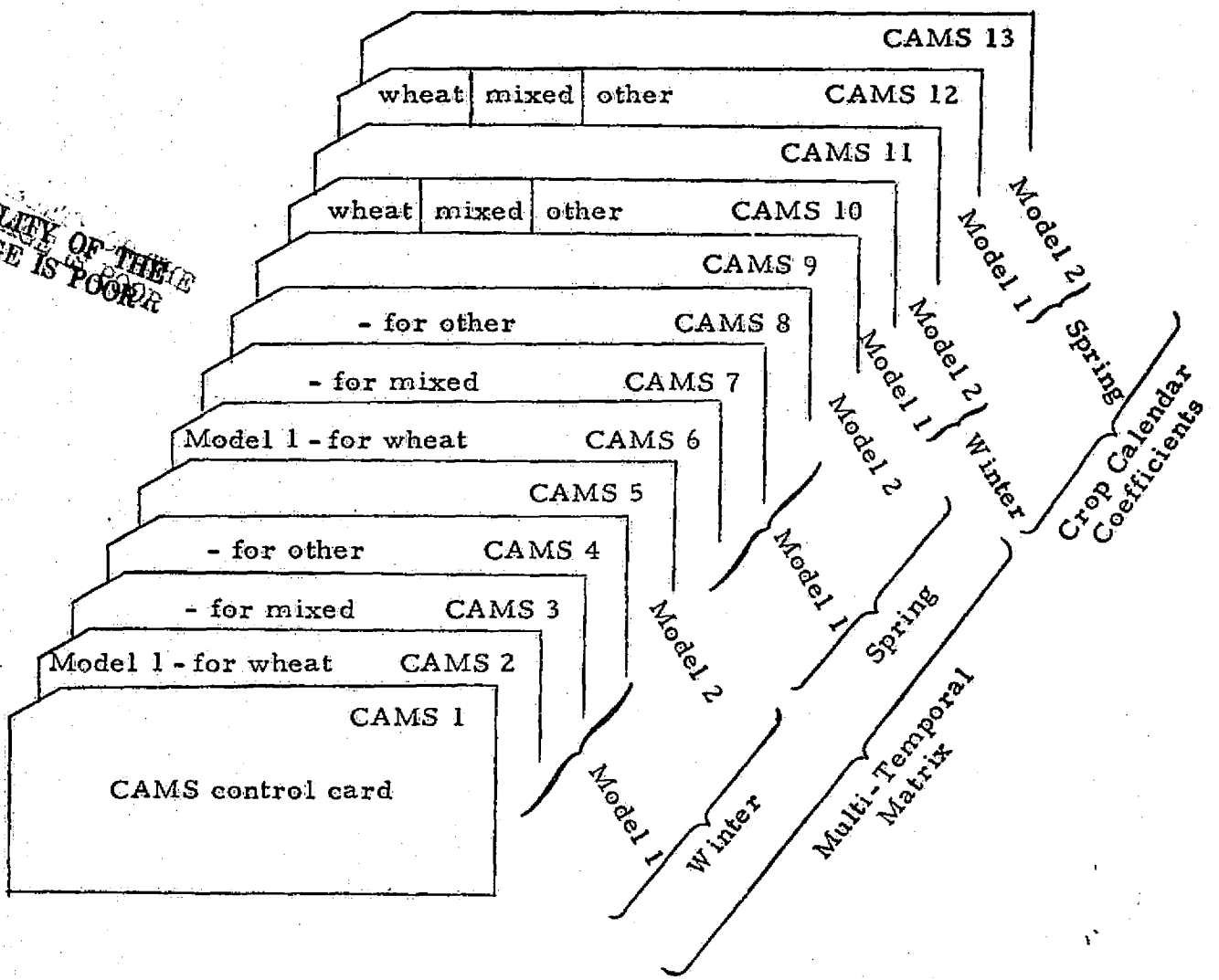
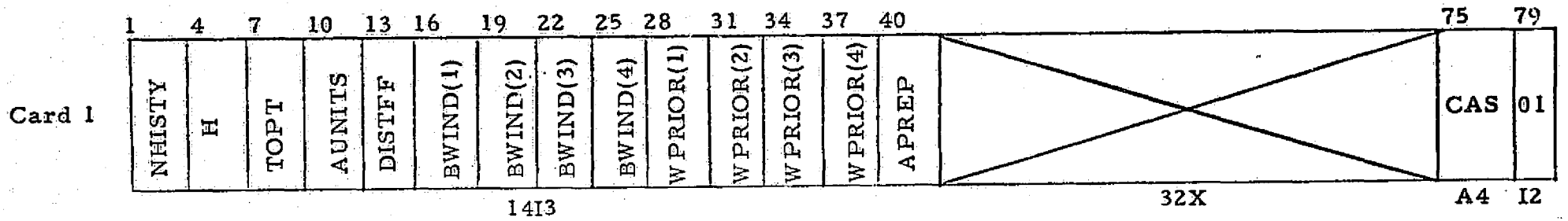


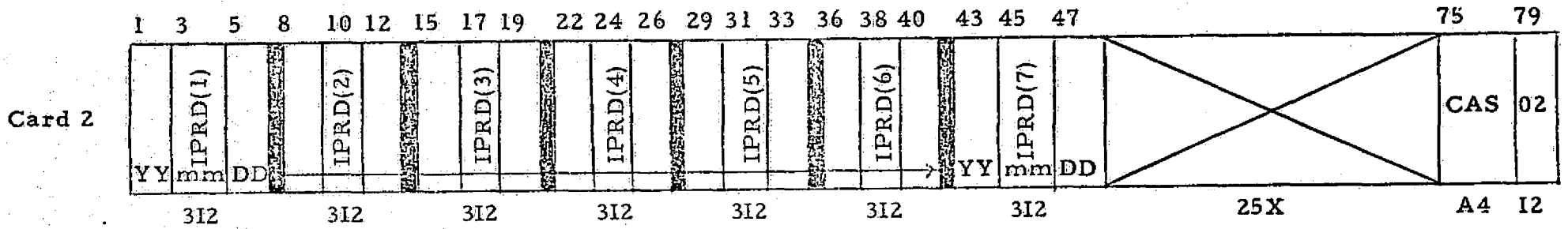
Figure 3.7-1. CAMS Deck Setup

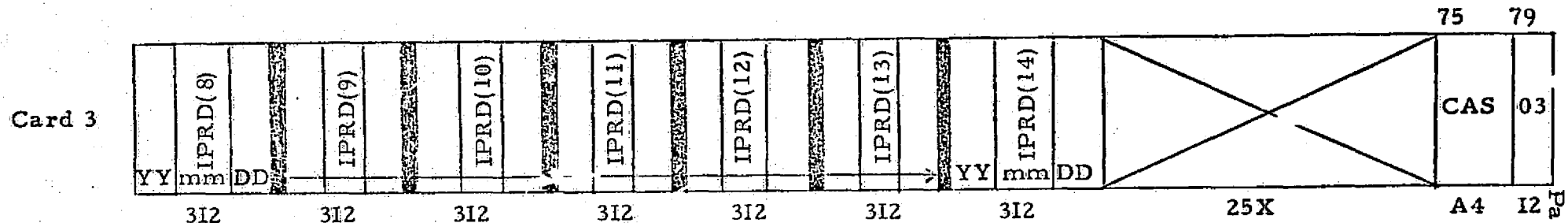
Table 3.7-7. CAS Input Data Description

Card Col.	Name	Dimension	Nominal Value	Range	Description
1-3	NHISTY	1	—	1-20	M = Number of historical years for Group III ratio calculations.
4-6	H	1	—	3-99	H = Minimum number of segments required for applying S^2 regression equation.
7-9	TOPT	1	0	0, 1	T - option flag: = 0 to set T = 0, = 1 to calculate T where T is the second term of the variance equation for $\hat{V}_{2S}$.
10-12	AUNITS	1	0	0, 1	Units Option: = 1 to print area in hectares and production in metric tons, = 0 to print area in acres and production in bushels
13-15	DISTFF	1	0	0, 1	CAS distribution file flag: = 0 to generate CAS distribution file, = 1 otherwise
16-27	IWIND	4	0	0, 1	Prediction bio-window flags: IWIND(n) = 1 to process bio-window n, = 0 otherwise
28-39	WPRIOR	4	0	0-4	Bio-window priorities: List of bio-windows in decreasing order of priority. e.g., 4, 1, 3, 2 or 3, 1, 0, 0
40-42	APREP	1	0	0, 1	Print option for area and production summary report: = 1 to print report, = 0 otherwise
1-48	IPRD	3, 14	0	>64 year 01-12 month 1-31 day	Prediction dates (up to 14 dates): IPRD (1, n) = year - 1900 IPRD (2, n) = month IPRD (3, n) = day The prediction dates must be in ascending order. The first zero date terminates the list.

Table 3.7-8. CAS Card Formats







3.7.2 Sample Card Inputs

HANDOVER TEST CASE (CAMS ERRORS = 0, VARY STG,YES) LPP SIMULATION CASE 1 PAGE 1

LEM INPUT CONTROL CARDS

```
TITLE
 HANDOVER TEST CASE          (CAMS ERRORS = 0, VARY STG,YES)          LEM 01

 ICASE  COUNTRY  NTRIAL  RSTART  IPRINT  STARTR  STARTZ  ENDR  ENDZ  ISTG  ICAMS  IYES  IACQ  ICLASS  ISEXT
   1     USA        4      =0       1      -0      -0     -0    -0     0      0     0     =0      0       0
 ISCC  ICAS2  ICAS3  IPRCAN  IPRYES  IPRCAS  LABEL
   0     0      0      1       1       1     LEM 02

 ICSESG  ICSECK  ICSESM  ICSECE  ICSEYM  ICSESE  ICSEAC  ICSEST  ICSECO  ICSEYS
    1       1       1       2       2       2       1       1     101       1
        RSEED1                  RSEED2                  LABEL
  .1000000000000+001      .1000000000000+001      LEM 03

        RSEED3                  RSEED4                  RSEED5                  RSEED6                  RSEED7          LABEL
  .1000000000000+001      .1000000000000+001      .1000000000000+001      .1000000000000+001      .1000000000000+001  LEM 04
```

HANDOVER TEST CASE (CAMS ERRORS = 0, VARY STG,YES) LPP SIMULATION CASE 1 PAGE 2

CAMS INPUT CONTROL CARDS

```
 IMODEL  IMULTI  ISIGEX  ISKIP  ITMAX  IREP  IWIND
   2       0       0       1      10     1     3      CAMS 1

 IGROUP( 5) ( 6) ( 7) ( 8) ( 9) (10) (11) (12) (13) (14) (15)    M2      M3
           2    2    2    2    2    3    3    3    3    3    3   .800    .400  CAMS 2
           2    2    2    2    2    2    2    2    2    2    2   .900    .700  CAMS 3
           3    3    3    3    3    3    3    3    3    3    3   .300    .100  CAMS 4
           2    2    2    3    3    3    3    3    3    3    3   .500    .200  CAMS 5
           2    2    2    2    3    3    3    3    3    3    3   .855    .855  CAMS 6
           2    2    3    3    3    3    3    3    3    3    3   .955    .755  CAMS 7
           2    2    2    3    3    3    3    3    3    3    3   .355    .155  CAMS 8
           2    2    2    2    2    3    3    3    3    3    3   .555    .225  CAMS 9

 G1      G2      H1      H2      G1      G2      H1      H2      G1      G2      H1      H2
.500    1.00    1.000   2.00    .500    1.00    1.000   2.00    .500    1.00    1.000   2.00   CAMS10
.500    1.00    .500    1.00                                                                   CAMS11
.500    1.00    1.000   2.00    .500    1.00    1.000   2.00    .500    1.00    1.000   2.00   CAMS12
.500    1.00    1.000   2.00                                                                   CAMS13
```

3.7.2 Sample Card Inputs (cont'd)

```
HANDOVER TEST CASE        (CAMS ERRORS = 0, VARY STG,YES)     LPP SIMULATION     CASE    1   PAGE   3


                C A S   I N P U T   C O N T R O L   C A R D S

 NHISTY   HR  TOPT  AUNITS  DISIFF  HWIND(1)  (2)  (3)  (4)  WPRIOR(1)  (2)  (3)  (4)  APREP
    5      8    1       1       1         1    1    1    0          3    1    2   -0     1   CAS  1

 IPRD( 1)   IPRD( 2)   IPRD( 3)   IPRD( 4)   IPRD( 5)   IPRD( 6)   IPRD( 7)
 76/ 1/15   76/ 2/ 1   76/ 2/15   -0/-0/-0   -0/-0/-0   -0/-0/-0   -0/-0/-0       CAS  2

 IPRD( 8)   IPRD( 9)   IPRD(10)   IPRD(11)   IPRD(12)   IPRD(13)   IPRD(14)
 -0/-0/-0   -0/-0/-0   -0/-0/-0   -0/-0/-0   -0/-0/-0   -0/-0/-0   -0/-0/-0       CAS  3

    0  NONFATAL ERRORS DETECTED ON CONTROL CARDS

    0  FATAL ERRORS DETECTED ON CONTROL CARDS
```

3.7.3 Output Report Data Definitions

There are no standard output reports for the LEM control program.

3.7.3.1 Segment Truth

See Table 3.7-9.

3.7.3.2 YES

See Table 3.7-10.

3.7.3.3 CAMS

CAMS prepares two report formats:

1. Ordinary segments data
2. Training segments data

Each report may be prepared with or without the individual error component contributions by input option (IREP). The definition of report parameters is given in Table 3.7-11. The parameters in parentheses are keyed to the output format given in Figure 3.7-2. Note that when TID = ****, the ordinary segment could not be properly correlated with a training segment. In this case the ordinary segment is classified as though it were a training segment. The resulting output has the ordinary segment titles with the training segment data parameters. In particular, data under Z1 is crop calendar data and data under Z2 is the multi-temporal sampling factor and is of the form:

	Z_1	Z_2
W	(DELTA)	(MULT)
M	(CROPD)	(MULT)
O	0.00	(MULT)

Also:

(TRAINR) = 0.00
(TRAIND) = 0.00
(ALOCAL) = (PES)

3.7.3.4 CAS

CAS prepares two reports:

1. Area and Production Summary Report
2. Country Summary Report

The definition of report parameters is given in Table 3.7-12.

Table 3.7-9. Segment Truth Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Substrata	-	1 - 9999	-	Seg. Tr.	Substrata no.
True PW for substrata	PW_k	0. - 100	%	Seg. Tr.	True proportion of wheat for a substrata
Segment	-	1 - 9999	-	Seg. Tr.	Segment no.
True PW for segment	PW_{k_i}	0 - 100	%	Seg. Tr.	True proportion of wheat for a segment
Average PW	-	0 - 100	%	Seg. Tr.	Average true proportion of wheat for all segments in a substrata
Error in PW	-	$\pm$ 100	%	Seg. Tr.	Difference between true PW for substrata, average PW for substrata
True PM for segment	PM_{k_i}	0 - 100	%	Seg. Tr.	True proportion of mixed crops for a segment
Iteration	-	1 - 100	-	Seg. Tr.	Monte Carlo iteration no.

Table 3.7-10. YES Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Iteration no.	-	1-100	-	Yes yield estimate	Monte Carlo iteration no.
Country	-	-	-	Yes yield estimate	4 character alphabetic country name
Region	-	1 - 999	-	Yes yield estimate	Region no. within a country
Zone	-	1 - 999	-	Yes yield estimate	Zone no. within a region
Stratum	-	1 - 9999	-	Yes yield estimate	Stratum no. within a zone
Predict. date Mo/Dy/Yr	-	-	-	Yes yield estimate	Date of prediction point
True yield	YSTR	0 - 100	QUINTALS/ HECTAR	Yes yield estimate	True strata yield
Estim. yield	YSCI	0 - 100	QUINTALS/ HECTAR	Yes yield estimate	Estimated strata yield
Percent error	-	0 - 100	%	Yes yield estimate	Absolute value of (est. - true) divided by true yield
Standard dev.	SD	0 - 100	QUINTALS/ HECTAR	Yes yield estimate	Input std. dev. of strata yield

Table 3.7-11. CAMS Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Country	-	-	-	1., 2.	4 character country ID
Region	-	1 - 999	-	1., 2.	Region no. within a country
Zone	-	1 - 999	-	1., 2.	Zone no. within a region
Strata	-	1 - 9999	-	1., 2.	Strata no. with
Substrata	-	1 - 9999	-	1., 2.	Substrata no. within a strata
Training segment	-	1 - 9999	-	2.	No. of training segment
Crop window window	-	1 - 4	-	1., 2.	Crop window no.
Acq. date Mo/Da/Yr	-	-	-	1., 2.	Segment acquisition date
Estim. Prop. (PES)	PW	0 - 100	%	1., 2.	Estimated proportion wheat for the segment
Total error					
(TOT)	-	±100	%	1., 2.	Difference est. and true prop. wheat for seg.
(ALOCAL)	-	±100	%	1.	Local est. for ordinary segment
Error					
Wheat					
Tot (ERTOT)	-	±10	-	1., 2.	0 mission error for pure wheat pixels } Mod. 1
Bias (ERBIAS)	-	±10	-	1., 2.	Bias component } Mod. 1
Rand (ERRAND)	-	±10	-	1., 2.	Random comp. } Mod. 1
					Total, Bias, and random error components } Mod. 2
Mixed					
Tot (ERTOT)	-	±10	-	1., 2.	Error for mixed wheat pixels } Model 1 only
Bias (ERBIAS)	-	±10	-	1., 2.	Bias component } Model 1 only
Rand (ERRAND)	-	±10	-	1., 2.	Random component } Model 1 only
Other					
Tot (ERTOT)	-	±10	-	1., 2.	Commission error for non-wheat pixels } Model 1 only
Bias (ERBIAS)	-	±10	-	1., 2.	Bias component } Model 1 only
Rand (ERRAND)	-	±10	-	1., 2.	Random component } Model 1 only

Table 3.7-11. CAMS Output Report Data Definitions (cont'd)

Report Name	Symbol	Range	Units	Report	Description
Classif. Error					
Wheat	-	± 10	-	2.	Same as "Error" without multi-temporal
Mixed	-	±10	-	2.	Sampling factor applied - training segments
Other	-	±10	-	2.	
Crop Cal.					
(DELTA)	-	±10	-	2.	Crop calendar error as a fraction of bio-window
(CROPD)	-	±100	days	2.	Crop calendar error in days
Multi-Temp					
W (MULT)	M(1)	0-1	-	2.	Multi-temp samp.fact.-wheat =M(1)
M (MULT)	M(2)	0 - 1	-	2.	Multi-temp samp.fact.-mix. Mod. 1=0 Mod. 2
0 (MULT)	M(3)	0 - 1	-	2.	Multi-temp samp.fact.-other =0
Ordinary segment	-	1 - 9999	-	1.	No. of ordinary segment
Sig. Ext.					
Wheat	-	±10	-	1.	Same as "Error" without multi-temporal
Mixed	-	±10	-	1.	Sampling factor applied - ordinary segments
Other	-	±10	-	1.	
Z1					=Z(1, 1)
W (Z)	Z(1, 1)	±10	-	1.	Sig.ext.multiplicative error Mod. =0 Mo
M(Z)	Z(2, 1)	±10	-	1.	for wheat(W), Mix.(M), Other(O) 1 =0 2
O(Z)	Z(3, 1)	±10	-	1.	
Z2					
W (Z)	Z(1, 2)	±10	-	1.	Sig. ext. additive = Z(1, 2)
M (Z)	Z(2, 2)	±10	-	1.	Error for wheat (W), Mod. 1 = 0 Mod. 2
O(Z)	Z(3, 2)	±10	-	1.	Mixed (M), Other (O) = 0
Train. Seg.					
(TID)	-	1 - 9999	-	1.	No. of training segment associated with ordinary segment (*999 indicates no train. seg)
(TRAINR)	-	100 →1000	%	1.	Percent agreement of local and sig. ext. est.
(TRAIND)	-	100 →1000	%	1.	Percent disagreement of local and sig. ext. est

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

COUNTRY XXXX, REGION XX, ZONE XXX, STRATA XXX, SUBSTRATA XXXX, TRAINING SEGMENT XXXX
TRUE PROPORTION WHEAT = XXX.XX

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	CLASSIF. ERROR WHEAT	CLASSIF. ERROR MIXED	CLASSIF. ERROR OTHER	CROP CAL		MULTI-TEMP
XXXXXXXXXXXXXXXX	XX/XX/XX	(PES)	(TOT)	TOT	(ERTOT)	(ERTOT)	(ERTOT)	(CLTOT)	(CLTOT)	(CLTOT)	(DELTA)	W	(MULT)
				BIAS	(ERBIAS)	(ERBIAS)	(ERBIAS)	(CLBIAS)	(CLBIAS)	(CLBIAS)	(CROPD)	M	(MULT)
				RAND	(ERRAND)	(ERRAND)	(ERRAND)	(CLRAND)	(CLRAND)	(CLRAND)		O	(MULT)
	XX/XX/XX	XXX.XX	XX.XXX		X.XXXX	X.XXXX	X.XXXX	X.XXXX	X.XXXX	X.XXXX	.XX		.XX

(1) If only estimate report wanted, from (1) to the right omitted.

COUNTRY XXXX, REGION XX, ZONE XXX, STRATA XXX, SUBSTRATA XXXX, ORDINARY SEGMENT XXXX
TRUE PROPORTION WHEAT = XXX.XX

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	SIG. EXT. WHEAT	SIG. EXT. MIXED	SIG. EXT. OTHER	Z1	Z2	TRAIN SEG.
XXXXXXXXXXXXXXXX	XX/XX/XX	(PES)	(TOT)	TOT	(ERTOT)	(ERTOT)	(ERTOT)	(CLTOT)	(CLTOT)	(CLTOT)	W	(Z)	(Z)	(TID)
				BIAS	(ERBIAS)	(ERBIAS)	(ERBIAS)	(CLBIAS)	(CLBIAS)	(CLBIAS)	M	(Z)	(Z)	(TRAINA)
			(ALOCAL)	RAND	(ERRAND)	(ERRAND)	(ERRAND)	(CLRAND)	(CLRAND)	(CLRAND)	O	(Z)	(Z)	(TRAIND)

Note: If model 2, MIXED and OTHER quantities will appear as zeros.

If unable to correlate ordinary segment acquisition with training segment and so treated as training segment, TRAIN SEG. column will appear as out of range (all *'s) and SIG. EXT. Z1 will have the CROP CAL data, and SIG. EXT. Z2 the MULTI-TEMP data.

Figure 3.7-2. CAMS Estimate and Error Reports

Table 3.7-12. CAS Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Country	-	-	-	1., 2.	4 character country designation
Biowindow	-	1-4	-	1.	Biowindow no.
Iteration	-	1 - 100	-	1., 2.	Monte Carlo iteration no.
Reg	-	1 - 999	-	1.	Region no. within country
Zone	-	1 - 999	-	1.	Zone no. within region
Strata	-	1 - 9999	-	1.	Strata no. within zone
True WA	WA	0 - 999999	1000 Hectares or 10000 acres	1.	True wheat area
Est. WA	$\hat{WA}$	0 - 999999	"	1., 2.	Estimated wheat area
No. in substrata group 1 2 3	-	0 - 9999	-	1.	Chg. no. of substrata belonging to group 1, 2 and 3 respectively
No. of segments of group 1 2	-	0 - 9999	-	1.	The no. of segments belonging to Group 1 and Group 2 substrata
CV area est. pct. true	-	0 - 999.99	%	1., 2.	Std. deviation of estimated area error in % of true area
CV error pct. true	-	0 - 999.99	%	1., 2.	Std. deviation of Monte Carlo area error in % of true area
True yield	Y	0 - 999.99	Quintals/ Hectare or Bushels/ acre	1.	True yield
Est. yield	$\hat{Y}$	0 - 999.99	Quintals/ Hectare or Bushels/ acre	1., 2.	Estimated yield
Std. dev. pct. error	-	-	Quintals/ Hectare or Bushels/ acre	1., 2.	Standard deviation yield percent error

Table 3.7-12. CAS Output Report Data Definitions (cont'd)

Report Name	Symbol	Range	Units	Report	Description
True prod.	PRD	0 - 999999	100000 bushels or 1000 metric tons	1.	True production of wheat
Est. prod.	$\hat{PRD}$	0 - 999999	100000 bushels or 1000 metric tons	1., 2.	Estimated production of wheat
CV PRD est. pct. true	-	0.999	%	1., 2.	Std. deviation of estimated production error in % of true production
CV error pct. true	-	0 - 999	%	1., 2.	Std. deviation of Monte Carlo production error in % of true production
Prediction point	-	-	-	2.	Bio window no. or prediction date
CV anal. WA (pct. true)	-	0 - 999	%	2.	Std. deviation of analytic within county area variation in % of true area
CV anal. prd. (pct. true)	-	0 - 999	%	2.	Std. deviation of analytic within county production error in % of true production
Historical area	$\tilde{area}$	0 - 999999	1000 Hectares or 10000 acres	2.	Historical wheat area of the country
True area	area	0 - 999999	1000 Hectares or 10000 acres	2.	True wheat area for the country
True yield	Y	0 - 999	Quintals/ Hectare or Bushels/ acre	2.	True yield for the country
True production	PRD	0 - 999999	100000 bushels or 1000 metric tons	2.	True production for the country

Table 3.7-12. CAS Output Report Data Definitions (cont'd)

Report Name	Symbol	Range	Units	Report	Description
Area confidence levels					
True/Error	-	0 - 999	%	2.	Confidence level about the true WA using the Monte Carlo area error variance
Est/EST	-	0 - 999	%	2.	Confidence level about the estimated WA using the estimated area error variance
True/Est	-	0 - 999	%	2.	Confidence level about the true WA using the estimated area error variance
True/WC	-	0- 999	%	2.	Confidence level about the true WA using the analytic within county area variance
Production confid. levels					
True/Error	-	0 - 999	%	2.	Confidence level about the true production using the Monte Carlo production error variance
Est/Est	-	0 - 999	%	2.	Confidence level about the estimate production using the estimate production error variance
True/Est	-	0 - 999	%	2.	Confidence level about the true production using the estimated production error variance
True/WC	-	0 - 999	%	2.	Confidence level about the true production using the analytic within county production error variance

3.7.4 Sample Pages from Output Reports

3.7.4.1 Segment Truth

See Figure 3.7-3.

3.7.4.2 YES

See Figure 3.7-4.

3.7.4.3 CAMS

1. See Figure 3.7-5 for Proportion Estimate Error Report - Ordinary Segments.
2. See Figure 3.7-6 for Proportion Estimate Error Report - Training Segments.

3.7.4.4 CAS

1. See Figure 3.7-7 for Area and Production Summary Report.
2. See Figure 3.7-8 for Country Summary Report.

3.7.5 File Requirements

The files, input, output or intermediate, are listed by subprogram. Refer to Section 2.2.7 for a LEM overview of the file requirements.

3.7.5.1 Segment Truth

Input: SUBHST - Substrata Historical File
SEGID - Segment ID File

Output: SEGTRU - Segment Truth File

3.7.5.2 YES

Input: YESERR - YES Error Data File

Output: YESOUT - YES Output File

HANDOVER TEST CASE (CAMS ERRORS = 0, VARY STG=YES) LPP SIMULATION CASE 1 PAGE 4

SEGMENT TRUTH REPORT

SUBSTRATA	TRUE PM FOR SUBSTRATA	SEGMENT	TRUE PM FOR SEGMENT	AVERAGE PM	ERROR IN PM	TRUE PM FOR SEGMENT	ITERATION
13	21.1346	1002	23.7288	23.7288	2.6943	10.5790	1
21	20.7206	1066	20.1972	20.1972	-.5234	9.0940	1
27	25.4075	1316	26.3991	25.3976	.9916	12.9333	1
		1317	24.3960		-1.0115	14.5148	
29	19.4182	1725	19.9864	19.9864	.5682	9.5548	1
63	20.2131	1726	20.9946	20.9946	.7815	12.1179	1
77	20.3416	1727	23.0274	23.0274	2.6858	12.5995	1
5	16.8315	1528	14.3566	15.9920	-2.4749	8.1626	1
		1529	17.6274		.7958	8.0460	
15	22.7811	1728	20.4260	22.0070	-2.3551	8.7625	1
		1729	21.8552		-.9278	12.0891	
		1730	24.2981		1.5170	11.3608	
		1731	21.4567		-1.3304	10.8279	
35	28.0811	1732	32.0787	32.0787	3.9975	12.3877	1
41	18.8676	1733	20.0073	18.0407	1.1397	15.2544	1
		1734	16.4150		-2.4526	8.4999	
		1735	17.6956		-1.1677	8.5117	
51	22.2834	1736	24.9978	24.9978	2.7144	11.2835	1
71	20.2719	1530	20.0419	19.9860	-.2300	10.9106	1
		1531	19.9301		-.3419	9.6088	

Figure 3.7-3. Sample Segment Truth Output Report

YES YIELD ESTIMATE DATA REPORT -ITERATION NO. 1

COUNTRY USA REGION 1 ZONE 30 STRATUM 30

PREDICT.DATE MO/DY/YR	TRUE YIELD QUIN./HECTAR	ESTIM.YIELD QUIN./HECTAR	PERCENT ERROR	STANDARD DEV. QUIN./HECTAR
12/ 1/75	6.95	13.46	94.26	3.36
1/15/76	6.95	6.42	7.27	2.69
2/15/76	6.95	5.20	24.98	2.02
3/ 1/76	6.95	6.43	7.13	1.35
3/15/76	6.95	6.57	5.17	.67
4/15/76	6.95	6.75	2.91	.00

COUNTRY USA REGION 1 ZONE 30 STRATUM 50

PREDICT.DATE MO/DY/YR	TRUE YIELD QUIN./HECTAR	ESTIM.YIELD QUIN./HECTAR	PERCENT ERROR	STANDARD DEV. QUIN./HECTAR
12/ 1/75	7.00	6.59	6.75	3.36
1/15/76	7.00	3.42	51.59	2.69
2/15/76	7.00	6.16	12.81	2.02
3/ 1/76	7.00	6.17	12.64	1.35
3/15/76	7.00	5.76	18.50	.67
4/15/76	7.00	6.73	4.76	.00

COUNTRY USA REGION 1 ZONE 30 STRATUM 70

PREDICT.DATE MO/DY/YR	TRUE YIELD QUIN./HECTAR	ESTIM.YIELD QUIN./HECTAR	PERCENT ERROR	STANDARD DEV. QUIN./HECTAR
12/ 1/75	7.20	8.55	18.76	3.36
1/15/76	7.20	6.04	16.07	2.69
2/15/76	7.20	3.68	48.86	2.02
3/ 1/76	7.20	7.89	9.59	1.35
3/15/76	7.20	6.76	6.06	.67
4/15/76	7.20	6.73	6.54	.00

Figure 3.7-4. YES Output Report

CAMS PROPORTION ESTIMATE DATA REPORT

COUNTRY USA ,REGION 1,ZONE 30,STRATA 20,SUBSTRATA 15,ORDINARY SEGMENT 1731
TRUE PROPORTION WHEAT= 21.45

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	SIG.EXT. WHEAT	SIG.EXT. MIXED	SIG.EXT. OTHER		Z1	Z2	TRAIN SEG.
****WINDOW 1****	1/ 7/76	26.34	4.88	TOT	.228	.000	.000	.228	.000	.000	W	-.35	1.00	****
				BIAS	-.156	.000	.000	-.156	.000	.000	M	-1.00	1.00	.00
			26.34	RAND	.383	.000	.000	.383	.000	.000	U	.00	1.00	.00

COUNTRY USA ,REGION 1,ZONE 30,STRATA 20,SUBSTRATA 55,ORDINARY SEGMENT 1752
TRUE PROPORTION WHEAT= 32.08

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	SIG.EXT. WHEAT	SIG.EXT. MIXED	SIG.EXT. OTHER		Z1	Z2	TRAIN SEG.
****WINDOW 1****	1/ 8/76	62.29	30.21	TOT	.942	.000	.000	.942	.000	.000	W	1.10	-.29	1529
				BIAS	.096	.000	.000	.096	.000	.000	M	.00	.00	91.70
			67.92	RAND	.846	.000	.000	.846	.000	.000	U	.00	.00	-8.50
****WINDOW 2****	1/23/76	25.98	-6.10	TOT	-.190	.000	.000	-.345	.000	.000	W	-.25	.55	****
				BIAS	-.062	.000	.000	-.112	.000	.000	M	-1.00	1.00	.00
			25.98	RAND	-.128	.000	.000	-.230	.000	.000	U	.00	1.00	.00

COUNTRY USA ,REGION 1,ZONE 30,STRATA 20,SUBSTRATA 41,ORDINARY SEGMENT 1735
TRUE PROPORTION WHEAT= 20.01

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	SIG.EXT. WHEAT	SIG.EXT. MIXED	SIG.EXT. OTHER		Z1	Z2	TRAIN SEG.
****WINDOW 1****	1/ 7/76	4.02	-15.98	TOT	-.799	.000	.000	-.799	.000	.000	W	1.10	-.06	1529
				BIAS	.096	.000	.000	.096	.000	.000	M	.00	.00	57.47
			7.00	RAND	-.894	.000	.000	-.894	.000	.000	U	.00	.00	-42.53

Figure 3.7-5. Sample CAMS Proportion Estimate Error Report - Ordinary Segments

CAMS PROPORTION ESTIMATE DATA REPORT

COUNTRY USA ,REGION 1,ZONE 30,STRATA 50,SUBSTRATA 13,TRAINING SEGMENT 1743
TRUE PROPORTION WHEAT= 20.52

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	CLASSIF.ERROR WHEAT	CLASSIF.ERROR MIXED	CLASSIF.ERROR OTHER	CROP CAL		MULTI-TEMP
****WINDOW 1****	1/ 8/76	20.29	3.77	TOT	.194	.000	.000	.194	.000	.000	-.11	W	1.00
				BIAS	-.143	.000	.000	-.143	.000	.000	-1	M	1.00
				RAND	.327	.000	.000	.327	.000	.000		O	1.00
	1/ 9/76	21.52	1.00	TOT	.049	.000	.000	.049	.000	.000	-.11	W	1.00
				BIAS	-.143	.000	.000	-.143	.000	.000	-1	M	1.00
				RAND	.192	.000	.000	.192	.000	.000		O	1.00
****WINDOW 2****	1/23/76	19.62	-.90	TOT	-.044	.000	.000	-.087	.000	.000	-.67	W	.50
				BIAS	.031	.000	.000	.061	.000	.000	-2	M	1.00
				RAND	-.074	.000	.000	-.148	.000	.000		O	1.00
	1/24/76	19.77	-.75	TOT	-.037	.000	.000	-.073	.000	.000	-.67	W	.50
				BIAS	.031	.000	.000	.061	.000	.000	-2	M	1.00
				RAND	-.067	.000	.000	-.134	.000	.000		O	1.00

COUNTRY USA ,REGION 1,ZONE 30,STRATA 50,SUBSTRATA 27,TRAINING SEGMENT 1744
TRUE PROPORTION WHEAT= 20.52

CROP WINDOW	ACQ DATE MO/DY/YR	ESTIM. PROP.	TOTAL ERROR		ERROR WHEAT	ERROR MIXED	ERROR OTHER	CLASSIF.ERROR WHEAT	CLASSIF.ERROR MIXED	CLASSIF.ERROR OTHER	CROP CAL		MULTI-TEMP
****WINDOW 1****	1/ 8/76	17.52	-3.02	TOT	-.147	.000	.000	-.147	.000	.000	-.33	W	1.00
				BIAS	-.156	.000	.000	-.156	.000	.000	-3	M	1.00
				RAND	.009	.000	.000	.009	.000	.000		O	1.00
****WINDOW 2****	1/23/76	33.06	12.52	TOT	.610	.000	.000	1.098	.000	.000	.33	W	.55
				BIAS	.126	.000	.000	.226	.000	.000	1	M	1.00
				RAND	.483	.000	.000	.871	.000	.000		O	1.00

Figure 3.7-6. Sample CAMS Proportion Estimate Error Report - Training Segments

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

HANDOVER TEST CASE (CAMS ERRORS = 0, VARY STG=YES) LPP SIMULATION CASE 1 PAGE 32

A R E A A N D P R O D U C T I O N S U M M A R Y R E P O R T

COUNTRY USA WINDOW 1 ITERATION 1

REG	ZONE	STRATA	AREA (THOUSAND HECTARES) TRUE WA	EST. WA	NO. IN SUBSTRATA GROUP 1	2	3	NO. SEGMENTS OF GROUP 1	2	CV AREA EST. PCT. TRUE	CV ERROR PCT. TRUE	YIELD (QUINTALS/HECTARE) TRUE YIELD	EST. YIELD	PCT. ST DEV ERROR	PRODUCTION (THOUSAND METRIC TONS) TRUE PROD	EST. PROD	CV PRD EST. PCT. TRUE	CV ERROR PCT. TRUE
1	30	10	836.0	1208.7	1	6	3	1	2	45.65	.00	6.79	6.73	.00	567.8	813.4	45.19	.00
1	30	20	763.3	748.2	1	0	2	14	0	21.93	.00	6.86	6.73	.00	523.6	503.2	21.50	.00
1	30	30	703.2	584.9	4	0	4	8	0	26.08	.00	6.95	6.73	.00	487.1	393.5	25.32	.00
1	30	50	877.8	842.7	2	0	8	5	0	42.36	.00	7.06	6.73	.00	619.8	566.7	40.35	.00
1	30	70	422.3	07.8	2	0	5	2	0	50.57	.00	7.20	6.73	.00	303.8	45.6	47.27	.00
1	30	80	587.8	462.6	1	0	6	1	0	76.91	.00	7.26	6.73	.00	397.6	311.1	71.22	.00
1	30	90	596.6	533.5	5	0	2	5	0	32.10	.00	7.55	6.73	.00	437.5	358.8	29.45	.00
REG	ZONE																	
1	30		4746.5	4538.4	22	6	28	34	2	10.39	.00	7.05	6.73	.00	3357.1	3052.1	15.68	.00
REGION		1	6251.7	6076.1	23	6	44	36	2	12.53	.00	7.05	6.73	.00	4393.6	4086.2	11.95	.00
COUNTRY			6251.7	6076.1	23	6	44	36	2	12.53	.00	7.05	6.73	.00	4393.6	4086.2	11.95	.00

Figure 3.7-7. Sample CAS Area and Production Summary Report

COUNTRY SUMMARY REPORT

COUNTRY USA ITERATION 1

PREDICTION POINT	AREA (THOUSAND HECTARES) EST. AA	CV ANAL PA (PCT TRUE)	CV AREA EST (PCT TRUE)	CV ERROR (PCT TRUE)	YIELD (QUINTALS/HECTARE) EST. YIELD	STDV PCT ERROR	PRODUCTION (THOUSAND METRIC TONS) EST. PRD	CV ANAL PRD (PCT TRUE)	CV PRD EST (PCT TRUE)	CV ERROR (PCT TRUE)
1	6076.1	2.06	12.53	.00	6.73	.00	4086.2	1.96	11.95	.00
2	6302.8	2.18	7.30	.00	6.73	.00	4236.7	2.08	7.02	.00
3	7281.0	.00	.00	.00	6.73	.00	4896.5	.00	.00	.00
1/15/76	6179.4	2.00	15.36	.00	6.42	.00	3969.2	13.12	17.95	.00
2/ 1/76	6287.3	1.81	11.86	.00	6.64	.00	4177.3	12.76	16.55	.00
2/15/76	6529.8	1.86	11.95	.00	7.05	.00	4464.5	9.98	16.76	.00

HISTORICAL AREA	5908.45	(THOUSAND HECTARES)
TRUE AREA	6231.66	(THOUSAND HECTARES)
TRUE YIELD	7.05	(QUINTALS/HECTARE)
TRUE PRODUCTION	4394.03	(THOUSAND METRIC TONS)

Figure 3.7-8. Sample CAS Country Summary Report

HANDOVER TEST CASE (CARS ERRORS = 0, VARY STG.YES) LPP SIMULATION CASE 1 PAGE 44

COUNTRY SUMMARY REPORT

COUNTRY USA ITERATION 1

PREDICTION POINT	AREA CONFIDENCE LEVELS TRUE/ERROR	EST/EST	TRUE/EST	TRUE/AC	PRODUCTION CONFIDENCE LEVELS TRUE/ERROR	EST/EST	TRUE/EST	TRUE/AC
1	.000	56.561	56.616	99.975	.000	56.561	52.177	93.712
2	.000	83.034	82.029	99.992	.000	83.034	79.464	99.685
3.	.000	100.000	.000	.000	.000	100.000	.000	.000
1/15/76	.000	58.213	58.502	99.998	.000	38.574	37.057	44.335
2/ 1/76	.000	60.084	59.938	99.999	.000	45.476	43.689	53.533
2/15/76	.000	60.504	59.367	99.998	.000	45.565	44.738	67.125

TRUE/ERROR AREA AND PRODUCTION CONFIDENCE LEVELS ARE CALCULATED ONLY FOR FINAL ITERATION

Figure 3.7-8. Sample CAS Country Summary Report (cont'd)

3.7.5.3 CAMS

Input: CAMERR - CAMS Error Data File
SIGEXT - Signature Extension Data File
CROPW - Crop Window Data File
SEGTRU - Segment Truth Data File
ACQUIS (Optional) - Acquisition Data File

Output: CAMSF - CAMS Output File

Intermediate: TACQ - Training Segment Save Data Storage

3.7.5.4 CAS

Input: SUBHST - Substrata Historical File
CAMSF - CAMS Output File
YESOUT - YES Output File

Output: CASF - CAS Cumulative File
CASDIS - CAS Distribution File

Intermediate: CASDSF - CAS First Pass Work File

3.7.6 Error and Recovery

3.7.6.1 LEM

3.7.6.1.1 General

The program will attempt to find as many errors as possible during the processing of the input control cards. The program will continue checking for additional input errors if any input error is detected. There are two levels of error. These are:

Level 1 - non-fatal, continue processing.

Level 2 - job fatal. Terminate job after processing all input control cards.

When a level 1 error is detected, the program will print an informative message and continue processing. When a level 2 error is detected, the program will print an informative message, set a fatal error flag, and continue processing. When all control cards have been processed the program will continue executing if no fatal errors were found or will return control back to the operating system if at least one fatal error is detected.

The errors which may be detected by the LEM control program itself are described below. Any error conditions which are detected by CAMS, YES, or CAS will be described separately in Sections 3.7.6.3, 3.7.6.2, and 3.7.6.4, respectively.

3.7.6.1.2 Input Errors Detected by LEM

1. Message:

   TOO MANY MONTE CARLO TRIALS REQUESTED. NTRIAL = n, RSTART = r. MAX. NO. OF TRIALS PER RUN IS m.

   Meaning:

   On the LEM control cards the user has specified n - r Monte Carlo trials for the current run but the program permits a maximum of m trials for any single run.

   Remedy:

   Fatal error -- the user should check NTRIAL and RSTART and be sure NTRIAL-RSTART does not exceed the maximum allowable value.

2. Message:

RSTART = r MUST BE LESS THAN NTRIAL = n.

Meaning:

RSTART, the final iteration number from the previous run from which the user is trying to restart, must be less than NTRIAL, the total number of iterations desired at the end of the current run.

Remedy:

Fatal error -- RSTART is fixed. Hence, NTRIAL must be increased on the LEM control cards.

3. Message:

STARTR = n_1 MUST BE BETWEEN 0 AND ENDR = n_2. ENDR MUST BE .LE. m.

Meaning:

The starting region n_1 and the ending region n_2 must satisfy the inequalities

$$0 \leq n_1 \leq n_2 \leq m$$

where m is the maximum region number.

Remedy:

Fatal error -- the user should check STARTR and ENDR on the LEM control cards to be sure they satisfy the above inequalities.

4. Message:

STARTZ = n_1 MUST BE BETWEEN 0 AND ENDZ = n_2. ENDZ MUST BE .LE. m.

Meaning:

The starting zone n_1 and the ending zone n_2 must satisfy the inequalities

$$0 \leq n_1 \leq n_2 \leq m$$

where m is the maximum zone number.

Remedy:

Fatal error -- the user should check STARTZ and ENDZ on the LEM control cards to be sure they satisfy the above inequalities.

5. Message:

ISTG = n_1, ICAMS = n_2, AND IYES = n_3 MUST ALL BE 0, 1, 2, OR 3.

Meaning:

One or more of the parameters ISTG, ICAMS, and IYES have an illegal value specified. The only allowable values are 0, 1, 2, or 3.

Remedy:

Fatal error -- specify the proper value(s) for the offending parameter(s) on the LEM control cards.

6. Message:

IF ICAMS IS NONZERO, THEN ISTG MUST BE NONZERO.
I.E. IF THE CAMS ERRORS ARE HELD CONSTANT, THEN SO MUST THE SEGMENT TRUTH ERROR.

Meaning:

Self-explanatory. The user cannot vary the Segment Truth error while holding the CAMS errors constant by setting ICAMS $\neq$ 0. However, it is possible to hold the Segment Truth error constant while varying the CAMS errors.

Remedy:

Fatal error -- change either ICAMS or ISTG on the LEM control cards.

7. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM SEGMENT ID FILE DOES NOT AGREE WITH INPUTS ICSESG = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong Segment ID file has been specified, or the wrong values have been specified for the parameters ICSESG and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper Segment ID file or specify the correct values for ICSESG and CUNTRY on the LEM control cards. It might be necessary to dump the header record of the Segment ID file.

8. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM CROP WINDOW FILE DOES NOT AGREE WITH INPUTS ICSECW = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong Crop Window file has been specified, or the wrong values have been specified for the parameters ICSECW and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper Crop Window file or specify the correct values for ICSECW and CUNTRY on the LEM control cards. It might be necessary to dump the header record of the Crop Window file.

9. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM CAMS ERROR FILE DOES NOT AGREE WITH INPU TS ICSECE = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong CAMS error file has been specified, or the wrong values have been specified for the parameters ICSECE and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper CAMS error file or specify the correct values for ICSECE and CUNTRY on the LEM control cards. It might be necessary to dump the header record of the CAMS error file.

10. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM THE SIGNATURE EXTENSION FILE DOES NOT AGREE WITH INPU TS ICSESE = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong signature extension file has been specified, or the wrong values have been specified for the parameters ICSESE and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper signature extension file or specify the correct values for ICSESE and CUNTRY. It might be necessary to dump the header record of the signature extension file.

11. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM THE DATA ACQUISITION FILE DOES NOT AGREE WITH INPUTS ICSEAC = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong Data Acquisition file has been specified, or the wrong values have been specified for the parameters ICSEAC and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper Data Acquisition file or specify the correct values of ICSEAC and CUNTRY. It might be necessary to dump the header record of the Data Acquisition file.

12. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM THE YES ERROR MODEL FILE DOES NOT AGREE WITH INPUTS ICSEYM = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong YES Error Model file has been specified or the wrong values have been specified for the parameters ICSEYM and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper YES Error Model file or specify the correct values for ICSEYMand CUNTRY. It might be necessary to dump the header record of the YES Error Model file.

13. Message:

CASE NUMBER = n_1 OR COUNTRY C_1 FROM THE SUBSTRATA HISTORICAL FILE DOES NOT AGREE WITHINPUTS ICSESH = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong Substrata Historical file has been specified or the wrong values have been specified for the parameters ICSESH and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper Substrata Historical file or specify the correct values for ICSESH and CUNTRY. It might be necessary to dump the header record of the Substrata Historical file.

14. Message:

CASE NUMBER = n_1 OR COUNTRY = C_1 FROM THE SEGMENT TRUTH FILE DOES NOT AGREE WITH INPUTS ICSEST = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong file has been specified as the Segment Truth file, or the wrong values have been specified for ICSEST and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper Segment Truth file or specify the correct values for ICSEST and CUNTRY. It might be necessary to dump the header record of the Segment Truth file.

15. Message:

CASE NUMBER = n_1 OR COUNTRY = C_1 FROM THE CAMS OUTPUT FILE DOES NOT AGREE WITH INPUTS ICSECO = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong file has been specified as the CAMS Output file, or the wrong values have been specified for ICSECO and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper CAMS Output file or specify the correct values for ICSECO and CUNTRY. It might be necessary to dump the header record of the CAMS Output file.

16. Message:

CASE NUMBER = n_1 OR COUNTRY = C_1 FROM THE YES OUTPUT FILE DOES NOT AGREE WITH INPUTS ICSEYS = n_2 AND CUNTRY = C_2.

Meaning:

Possibly the wrong file has been specified as the YES Output file, or the wrong values have been specified for ICSEYS and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper YES Output file or specify the correct values for ICSEYS and CUNTRY. It might be necessary to dump the header record of the YES Output file.

17. Message:

CASE NUMBER = n_1 OR COUNTRY = C_1 FROM THE CAS CUM OUTPUT FILE DOES NOT AGREE WITH INPUTS ICASE = n_2 AND CUNTRY = C_2.

Meaning:

On a restart run the case number and country of the CAS Cum Output file must agree with the parameters ICASE and CUNTRY on the LEM control cards. Possibly the wrong file has been mounted, or the wrong values have been specified for ICASE and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper CAMS Cum file or specify the proper values for ICASE and CUNTRY. It might be necessary to dump the header record of the CAMS Cum file.

18. Message:

CASE NUMBER = n_1 OR COUNTRY = C_1 FROM THE CAS DIST OUTPUT FILE DOES NOT AGREE WITH INPUTS ICASE = n_2 AND CUNTRY = C_2.

Meaning:

On a restart run the case number and country of the CAS Distribution Output file must agree with the parameters ICASE and CUNTRY on the LEM control cards. Possibly the wrong file has been mounted, or the wrong values have been specified for ICASE and CUNTRY on the LEM control cards.

Remedy:

Fatal error -- mount the proper CAS Distribution file or specify the proper values for ICASE and CUNTRY. It might be necessary to dump the header record of the CAS Distribution file.

19. Message:

IMPROPER HEADER LABEL ON FILE filename.
LABEL = label.

Meaning:

The file label specified in the first two words of the header record of the file "filename" does not correspond to the expected label. Possibly the wrong file has been mounted.

Remedy:

Mount the proper file. It might be necessary to dump the header record of the designated file.

20. Message:

IMPROPER LABEL AND SEQUENCE NUMBER ON A LEM CONTROL CARD. LABEL AND SEQ. NO. = _____.

Meaning:

The four LEM control cards are supposed to have LEM (1) 0i entered in Columns 75-80 (where i = 1, 2, 3, or 4). Possibly the control cards are out of order.

Remedy:

Be sure the LEM control cards are in the proper order and that the label and sequence numbers are entered properly.

21. Message:

ITERATION NUMBER NT FROM filename FILE = n DOES NOT AGREE WITH RSTART = r FROM LEM CONTROL CARD.
where filename = CASCUM or CASDIS

Meaning:

The iteration number NT from both the CAS Cumulative file (CASCUM) and the CAS Distribution file (CASDIS) must be consistent with the value of RSTART specified on the LEM control cards. Possibly the wrong file has been specified or else RSTART is specified incorrectly.

Remedy:

Fatal error -- mount the proper file or specify the correct value for RSTART.

3.7.6.1.3 Processing Errors

Each of the modules STG, CAMS, YES, and CAS performs its own error checking during execution. The error messages for CAMS and CAS are described separately in Sections 3.7.6.3 and 3.7.6.4. The error messages for the Segment Truth Generator and the YES module are described below.

3.7.6.1.3.1 Processing Errors Detected by the Segment Truth Generator

1. Message:

THE SEGMENT ID FILE AND THE SUBSTRATA HISTORICAL FILE ARE INCONSISTENT.

	SEGID	SUBHST
REGION	r1	r2
ZONE	z1	z2
STRATA	s1	s2
SUBSTRATA	k1	k2

Meaning:

The region, zone, strata, and/or substrata ID's do not agree between the SEGID file and the SUBHST file. Perhaps the wrong file has been specified for one or both files. This error message was intended primarily for checkout purposes. The error should not occur during production usage.

Remedy:

Non-fatal error -- the segment from the SEGID file will be dropped and execution will continue. However, the user should check both files to be sure the proper files have been specified. It may be necessary to dump part or all of one or both files.

2. Message:

SEGMENT σ IS NOT IN IDSEG FROM SUBHST FOR REGION r, ZONE z, STRATA s, SUBSTRATA k
SEGMENT WILL BE DROPPED.

Meaning:

The indicated segment ID σ from the Segment ID file was not found in the array IDSEG read from the SUBHST file. Apparently the SEGID file and the SUBHST file are inconsistent.

Remedy:

Non-fatal error -- the indicated segment will be ignored and execution will proceed. However, the user should check both files to be sure the proper files have been specified.

3. Message:

ERROR RETURN FROM BETAD ROUTINE.
IER = f. PWK = PW_k SIGMA = σ PWKI = PW_i

Meaning:

An error return from the Beta Distribution routine has occurred in STG. The error flag f indicates the nature of the error.

f = 1 XBAR = PWK ($\overline{X} = PW_k$) is not in the range $0 \leq \overline{X} \leq 1$. $\overline{X}$ was reset within BETAD.

f = 2 σ not in the range $0 \leq \sigma \leq \overline{X} \sqrt{\frac{1-\overline{X}}{\overline{X}+\epsilon}}$

where $\epsilon = 10^{-4}$

σ was reset within BETAD.

f = 3 the random number could not be found within 35 iterations via the inverse incomplete Beta function method, so XI set to XBAR.

Remedy:

The error is non-fatal and the program continues execution.

4. Message:

ERROR RETURN FROM BETAD ROUTINE.
IER = f . PMMEAN = PM_k SIGMA = σ

Meaning:

Similar to error message 3 described above except that here
XBAR = PMMEAN
($\overline{X} = PM_k$)

Remedy:

If IER = 1 or 2, the error is non-fatal and the program continues execution.

If IER = 3, then the user should check the values PW_k, DELTPM, and CV_3 from the SUBHST file.

5. Message:

WARNING... NSEGS = n .NE. NSEG
(FROM SUBHST) = m
SEGMENT IDS MAY BE INCORRECT.

Meaning:

The number of segments read from the SEGID file does not agree with NSEG, the number of segments on the SUBHST file. Possibly the two files are inconsistent. The error is considered to be non-fatal by the program, but the error may be quite serious and the results should be regarded with suspicion.

Remedy:

Check to be sure the SEGID and SUBHST files are consistent. It might be necessary to dump all or part of both files.

6. Message:

WARNING... NO SEGMENTS PROCESSED BY SEGMENT TRUTH GENERATOR.

Meaning:

For some reason the Segment Truth Generator failed to process any segments. This is a very degenerate situation and should not normally be encountered in production runs. The most likely explanation is that all of the substrata processed by STG had zero segments.

Remedy:

Non-fatal error -- however, this condition will probably cause an abort in CAMS. Check the SUBHST file. Also check STARTR, STARTZ, ENDR, ENDZ.

3.7.6.2 YES

3.7.6.2.1 General

There are two possible errors besides system errors in YES, which generate the following messages:

YES INPUT FILE (YESERR) - BEGINNING REGION AND ZONE NOT FOUND

YES INPUT FILE (YESERR) - ENDING REGION AND ZONE NOT FOUND

If the beginning region and zone are not found, this is a fatal error, and causes return of control immediately to LEM. If the ending region and zone are not found, this generates a warning, but LEM will continue, having processed all records from the beginning region and zone to the end of file. The beginning and ending regions and zones are specified on the LEM control cards.

3.7.6.3 CAMS

3.7.6.3.1 General

See Section 3.7.6.1.1 for a summary of overall error handling.

3.7.6.3.2 Input Data Errors

1. CAMS XX MODEL NOT 1 OR 2 - X

   Fatal error - model number on CAMS control card, CAMS 01, is not 1 or 2. See Table 3.7-4.

2. CAMS XX ITMAX NOT BETWEEN 0 AND 99 - XX

   Fatal error - ITMAX value on CAMS control card bad. See Table 3.7-4.

3. CAMS XX IWIND NOT BETWEEN 0 AND 4 - X

   Fatal error - IWIND value bad (note that 1-4 good values, 0 = default value, set to 4) on CAMS control card. See Table 3.7-4.

4. BAD CAMS ID OR SEQUENCE NO. - XXX XX

   Fatal error - CAMS control cards bad, perhaps out of order, or missing one. See Figure 3.7-1.

5. CAMS XX CROP CALENDAR COEF. OUT OF RANGE - XXXXX

   Fatal error - crop calendar coefficient should be between ± 9.999 or ± 99.99. See Table 3.7-6.

6. CAMS XX BAD MULTI-TEMPORAL MATRIX VALUE M(X) - XXXX

   Fatal error - M2 not in range $M3 \leq M2 < 1.0$ or M3 not in range $0 \leq M3 \leq M2$. See Table 3.7-5.

7. CAMS XX BAD MULTI-TEMPORAL MATRIX VALUE IGROUP (XX) - X

   Fatal error - IGROUP value not 1, 2, or 3. See Table 3.7-5.

3.7.6.3.3 Processing Errors

1. CAMS INPUT TAPE SEGTRU - BEGINNING REGION AND ZONE NOT FOUND

   Fatal error - start region and zone specified on LEM control card, LEM 02, is not present in file.

2. CAMS INPUT TAPE SEGTRU - ENDING REGION AND ZONE NOT FOUND

   Warning - end region and zone were not found, so CAMS processed all records until EOF (end-of-file).

3. CAMS INPUT TAPE XXXX - MISSING RECORD

   Fatal error - input tape does not correlate correctly with key tape SEGTRU - perhaps wrong file mounted for SEGID or this input tape.

4. BETA DISTRIBUTION ERROR - FLAG = X

   Warning - Beta distribution subroutine, BETAD, returns error for mean production error:

   a. FLAG = 1 — mean not in range $0 \leq \text{mean} \leq 1$ so if mean > 1, mean set to 1; mean < 0, mean set to 0.

   b. FLAG = 2 — sigma not in range $0 \leq \text{sigma} \leq \text{XBAR}\sqrt{\frac{1-\text{XBAR}}{\text{XBAR}+10^{-4}}}$ so was reset within BETAD.

   c. FLAG = 3 — the random number could not be found within 35 iterations via the inverse incomplete Beta function method, so XI set to XBAR.

3.7.6.4 CAS

3.7.6.4.1 General

The program will attempt to find as many errors as possible during the processing of the input control cards. The program will continue checking for additional input errors if any input error is detected. There are two levels of error. These are:

Level 1 - non-fatal, continue processing.

Level 2 - job fatal. Terminate job after processing all input control cards.

When a level 1 error is detected, the program will print an informative message and continue processing. When a level 2 error is detected, the program will print an informative message, set a fatal error flag, and continue processing. When all control cards have been processed, the program will continue executing if no fatal errors were found or will return control back to the operating system if at least one fatal error is detected.

The errors which may be detected by the CAS Simulator are described below.

3.7.6.4.2 Input Errors Detected by CAS

1. Message:

IMPROPER LABEL AND SEQUENCE NUMBER ON A CAS CONTROL CARD. LABEL AND SEQ. NO. = _____

Meaning:

Fatal error -- the three CAS control cards are supposed to have CAS 0i entered in Columns 75-80 (where i = 1, 2, or 3). Possibly the control cards are out of order. The CAS control cards must always be preceded by the LEM control cards and the CAMS control cards.

Remedy:

Be sure that the LEM, CAMS, and CAS control cards are all present, and are in the proper order. Check the label and sequence numbers to be sure they are entered properly.

2. Message:

NHIST = m IS OUT OF RANGE.
(1 .LE. NHIST .LE. 20)

Meaning:

Fatal error -- NHIST must satisfy $1 \leq NHIST \leq 20$.

Remedy:

Change the input value of NHIST or change the limits of NHIST within the CAS Simulator (subroutine CASIN).

3. Message:

HH = h IS OUT OF RANGE
(3 .LE. HH .LE. 99)

Meaning:

Non-fatal error -- HH must be within range

$$3 \leq HH \leq 99$$

in order to apply the regression relation for S^2.

Remedy:

Change the input value of HH or change the limits for HH within the CAS Simulator (subroutine CASIN). The program will set HH = 99999 so that the first formula for S_o^2 will always be used.

4. Message:

ILLEGAL WINDOW SPECIFIED IN WPRIOR = W_1, W_2, W_3, W_4
(EACH WINDOW MUST BE 1-4 OR 0)

Meaning:

Fatal error -- an improper value has been specified for one or more of the windows in the array WPRIOR. The only allowable values are 0, 1, 2, 3, or 4.

Remedy:

Correct the offending values.

5. Message:

ALL ENTRIES IN WPRIOR ARE ZERO

Meaning:

Fatal error -- each entry in the array WPRIOR is zero, but at least one window 1-4 must be specified.

Remedy:

Specify at least one non-zero window number in the array WPRIOR.

6. Message:

ILLEGAL PREDICTION DATE yy/mm/dd SPECIFIED. YEAR = yy MUST BE .GE. 64, MONTH = mm MUST BE 1-12, DAY MUST BE 1-31

Meaning:

Fatal error -- an illegal prediction date has been specified in the array IPRD. The prediction date must satisfy

$year \geq 64$

$1 \leq month \leq 12$

$1 \leq day \leq 31$

Note: Dates such as Feb. 30 or Sept. 31 will be accepted by the program without being recognized as being in error.

Remedy:

Correct the offending dates.

7. Message:

PREDICTION DATES NOT IN ASCENDING ORDER OR DUPLICATES.

Meaning:

Fatal error -- the prediction dates entered in the array IPRD must be in ascending order with no duplicates.

Remedy:

Enter the prediction dates in ascending order and eliminate any duplicates.

3.7.6.4.3 Processing Errors Detected by CAS

1. Message:

DIVISION BY ZERO NOT ALLOWED
EQN. (n), symbol = 0.

Meaning:

Fatal error -- the program detected a zero divisor in attempting to compute equation (n). The offending zero divisor is indicated symbolically by "symbol."

Remedy:

The user should attempt to discover why the indicated quantity was zero. Usually potential zero divisors were supposed to be anticipated during the analysis leading to the coding of the CAS Simulator. The program logic should avoid the calculation of zero divisors.

2. Message:

IF NT = 1, VARIANCE ERRORS AND CONFIDENCE LEVELS CAN NOT BE COMPUTED AND WILL ARBITRARILY SET TO ZERO.

Meaning:

Non-fatal error -- on the first Monte Carlo iteration it is not possible to compute the variance errors VEA_C, VEP_C, and VEY_C and the confidence levels CLWA, CLPRD, etc. These values will arbitrarily set to zero.

Remedy:

Not required.

3. Message:

STARTING REGION r_t NOT FOUND ON filename FILE.
(where filename is YESOUT, SUBHST, or CAMSF)

Meaning:

Fatal error -- the starting region r_{st} specified by STARTR on the CAS control cards was not found on the indicated file. Either STARTR is incorrect or something is wrong with the indicated file.

Remedy:

Change STARTR or mount the correct file. It might be necessary to dump part of the file to determine the starting region and zone numbers.

4. Message:

STARTING ZONE z_{st} NOT FOUND ON filename FILE
(where filename is YESOUT, SUBHST, or CAMSF)

Meaning:

Fatal error -- the starting zone z_{st} specified by STARTZ on the CAS control cards was not found on the indicated file. Either STARTZ is incorrect or something is wrong with the indicated file.

Remedy:

Change STARTZ or mount the correct file. It might be necessary to dump part of the file to determine the starting region and zone numbers.

5. Message:

ENDING REGION r_{end} NOT FOUND ON filename FILE
(where filename is YESOUT, SUBHST, or CAMSF)

Meaning:

Non-fatal error -- the ending region r_{end} specified by ENDR on the CAS control cards was not found on the indicated file. Either ENDR is incorrect or something is wrong with the indicated file. The program will use all regions up to the end of data on the file.

Remedy:

Change ENDR. Zero is a permissible value indicating to use all regions up to the end of data.

6. Message:

ENDING ZONE z_{end} NOT FOUND ON filename FILE
(where filename is YESOUT, SUBHST, or CAMSF)

Meaning:

Non-fatal error -- the ending zone z_{end} specified by ENDZ on the CAS control cards was not found on the indicated file. Either ENDZ is incorrect or something is wrong with the indicated file. The program will use all zones up to the end of the last region or the region indicated by ENDR.

Remedy:

Change ENDZ. Zero is a permissible value indicating to use all zones of the final region (ENDR).

7. Message:

ZERO PREDICTION DATES ON YESOUT FILE FOR REGION r, ZONE z, STRATUM s (DATA RECORD n)

Meaning:

Fatal error -- all six prediction dates from the YESOUT file are zero for the indicated region, zone, and stratum. Thus the program cannot determine which value of estimated yield to use. Something must be wrong with the YESOUT file.

Remedy:

Dump out part of the YESOUT file to check the prediction dates and yields. In particular record n+1 should be checked.

8. Message:

ILLEGAL GROUP NUMBER g FROM SUBHST FOR REGION r, ZONE z, STRATUM s, SUBSTRATUM k (DATA RECORD n)

Meaning:

Fatal error -- the group number g from the n^{th} data record of the Substrata Historical File SUBHST is not 1, 2, or 3, indicating something is wrong with the SUBHST file.

Remedy:

Dump out the n+1 record of file SUBHST to check the group number and other substrata data.

9. Message:

NAGR = n OR NA = m FROM FILE SUBHST ARE ZERO. GROUP NUMBER g IS CHANGED TO 3.

Meaning:

Non-fatal error -- one or both of the quantities NAGR and NA from the Substrata Historical File are zero. Thus the group number g was changed to 3 by the CAS Simulator.

Remedy:

The input to the LUMP program, which generated SUBHST. If NAGR or NA are zero, then the group number should be 3.

10. Message:

INCONSISTENCY BETWEEN YESOUT AND SUBHST FILES.

	RECORD	REGION	ZONE	STRATA
YESOUT	n_1	r_1	z_1	s_1
SUBHST	n_2	r_2	z_2	s_2

Meaning:

Fatal error -- the region, zone, and strata from the YESOUT and SUBHST files do not agree. Agreement was supposed to be assured by the YES module.

Remedy:

This error should never occur in production. The logic of the YES and CAS modules should be carefully checked. Also it might be necessary to dump portions of the two files.

11. Message:

INCONSISTENCY BETWEEN SUBHST AND CAMSF.

	RECORD	REGION	ZONE	STRATA	SUBSTRATA
SUBHST	n_1	r_1	z_1	s_1	k_1
CAMSF	n_2	r_2	z_2	s_2	k_2

Meaning:

Fatal error -- the region, zone, strata, and substrata from the SUBHST and CAMSF files do not agree. Agreement should have been assured by the CAMS module. Actually, the CAMS module uses the CROPW file rather than SUBHST, but the two files should agree with each other and thus with CAMSF.

Remedy:

This error should never occur in production. The logic of the CAMS and CAS modules should be carefully checked. Also, it might be necessary to dump portions of the two files.

12. Message:

ERROR RETURN FROM BETA DISTRIBUTION SUBROUTINE.
ERROR FLAG = n.

Meaning:

Non-fatal -- an error was detected by the BETAD subroutine while CAS was attempting to compute PW'_K, the production wheat for the most recent non-epoch year.

The meaning of the error flag is as follows:

1. $\bar{X}$ not within range $0 \leq \bar{X} \leq 1$ so was reset within BETAD.

2. σ not within range

$$0 \leq \sigma \leq \bar{X} \sqrt{\frac{1 - \bar{X}}{\bar{X} + \epsilon}}$$

where $\epsilon = 10^{-4}$

so σ was reset within BETAD.

3. the random number could not be found within 35 iterations via the inverse incomplete Beta function method, so XI set to XBAR.
$\bar{X}$ is the mean value $\tilde{PW}_K$

σ is the standard deviation

$$\sigma = CV_1 * \tilde{PW}_K$$

13. Message:

NO SEGMENTS IN SUBSTRATA k, STRATA s, ZONE z, REGION r (SUBHST RECORD n).

Meaning:

Fatal error -- the program detected a group I substrata with no segments. Only group II or group III substrata with no segments are permitted.

Remedy:

Check record n+1 of the SUBHST file (in particular check GRPNO and NSEG). This error should never occur during production.

14. Message:

ZERO OR NEGATIVE DIVISOR IN COMPUTING TAU2A, SIGM2S (EQS. 93D-93F)

Meaning:

Fatal error -- the denominator DENOM = HWA12 + RN2(v) * $(MYV12)^{1/2}$ in Eqns. 93d, 93e, and 93f in the calculation of τ_S^2 and σ_S^2 is zero or negative (subroutine DSIO). This probably indicates that the group I, II historical wheat area and the multiyear variance are zero. The program logic should never reach this point (see message 15).

Remedy:

Modify the input to the LUMP program so the historical wheat area is non-zero.

15. Message:

WARNING... HIST PW = $\tilde{PW}$ FOR SUBSTRATA k, STRATA s, ZONE z, REGION r.
GROUP NO. CHANGED TO 3.

Meaning:

Non-fatal -- the program will not accept a group I or group II substrata with a zero (or negative) value of historical PW from the SUBHST file.

Remedy:

None required -- the program will automatically change the group number to 3 and proceed. The user may wish to enter a non-zero value of HIST PW in the LUMP input data.

16. Message:

INPUT PREDICTION DATE (m) = d
.LT. ALL PREDICTION DATES ON YESOUT FILE FOR STRATA s, ZONE z, REGION r (RECORD n).

Meaning:

Non-fatal -- the m^{th} Zulu prediction date (obtained from the m^{th} prediction date on the CAS input control card data) is less than all prediction dates on the YESOUT file for the indicated stratum on the n^{th} YESOUT data record).

Remedy:

The error is non-fatal. The program will drop the indicated stratum and proceed. However, the user may wish to check the prediction dates entered on the CAS control cards.

17. Message:

TOO MANY MONTE CARLO ITERATIONS FOR THE CAS DISTRIBUTION FILE.

Meaning:

Fatal error -- a maximum of 100 Monte Carlo iterations is allowed, if the CAS distribution file is to be generated.

Remedy:

Specify NTRIAL $\leq$ 100 in the LEM control card data or specify DISTFF = 0 in the CAS control card data. If more than 100 iterations are required and if the CAS distribution file is desired, then the dimensions of the arrays CASDSB and BUFFR in common block /CASCNM/ may have to be increased. Also the routine RWDISF would have to be modified.

18. Message:

Symbol IN EQ. n = a
REF. VALUE = b

Meaning:

Non-fatal -- in subroutine YSUB, which calculates a quantity Y, the argument a for the square root is negative, which could cause trouble. To avoid the problem, the program resets

$$a = 0. \quad \text{if} \quad a < 0$$

and prints a warning if

$$|a| \geq b \times 10^{-7}$$

Remedy:

None required -- the error is non-fatal, and execution will continue with $a = 0$ and $Y = 10^{-30}$. However, if $|a|$ is significantly large, the user should investigate why.

Note: To prevent excessive amounts of printout, this message will be printed a maximum of five times per iteration.

3.8 POUT

Operational Assumptions

- Only one major type of printed report will be produced per run.
- Population reports will be produced by option for either zone, region or country level.
- For Population or Monte Carlo reports any one, a set, or all of the parameters can be selected in one run.
- The Substrata Historical File will also be required to produce the first three Population reports.
- Printed report control will be by card input.
- All control card input data will be echo printed.
- All control card input data will be checked for errors before any error will cause the processing to terminate in the middle of a case.
- External print units will be in English, an optional override is available for metric units via the control card input.
- The Header Card and the four Data Cards are required input.
- All data to be processed will be obtained from disk (or tape) files.
- All input data files will be checked for correct case numbers.

3.8.1 Input Card Data

3.8.1.1 List of Data Quantities

See Table 3.8-1.

3.8.1.2 Card Formats

"POUT" is punched in card columns 75-78 of all cards. A sequence number is punched in card columns 79-80. See Table 3.8-2.

Table 3.8-1. POUT Input Data Description

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
IHEADR	-	12	Blanks	-	-	72 character case header which prints out at the top of every page
RPTYPE	-	1	0	1 - 4	-	Major type of report identification 01 - Substrata Reference Data Report 02 - Population Mean, Standard Deviation and Histogram Report 03 - Histograms of Monte Carlo Statistics Report 04 - Frequency of Sample Segment Acquisitions Reports
AUNITS	-	1	0	0, 1	-	External print units flag 0 - English units Wheat area value in 10,000 acres Production value in 100,000 bushels Yield value in bushels/acre ≠0 - Metric units Wheat area value in 1000 hectares Production value in 1000 metric tons Yield value in quintals/hectare
START	-	1	-500.0	-999.9 to 999.9	-	Histogram interval start value
INTVL1	-	1	100.0	0.1 to 100.0	-	Histogram interval value in percent
BREAK1	-	1	-100.0	-999.9 to 999.9	-	Histogram breakpoint to change interval value
INTVL2	-	1	5.0	0.1-100.0	-	Histogram interval value in percent
BREAK2	-	1	100.0	-999.9 to 999.9	-	Histogram breakpoint to change interval value

Table 3.8-1. POUT Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
INTVL3	-	1	100.0	0.1-100.0	-	Histogram interval value in percent
STOP	-	1	500.0	-999.9 to 999.9	-	Histogram interval terminal value A maximum of 51 range intervals is allowed although less may be used. Intervals may not overlap.
PARMTR	-	5	0	0-3	-	Report parameter type option flags for RPTYPE = 02 or 03. =0 - no report; ≠0 - produce report. PARMTR(1)≠0 RPTYPE = 02 Produce Population Sampling Error Report ≠0 RPTYPE = 03 Produce Monte Carlo Area Error Report PARMTR(2)≠0 RPTYPE = 02 Produce Population CAMS Error Report ≠0 RPTYPE = 03 Produce Monte Carlo Production Error Report PARMTR(3)≠0 RPTYPE = 02 Produce Population Yield Error Report ≠0 RPTYPE = 03 Produce Monte Carlo Yield Error Report PARMTR(4)≠0 RPTYPE = 02 Produce Population Area Error Report ≠0 RPTYPE = 03 Produce Confidence Level Report PARMTR(5)≠0 RPTYPE = 02 Produce Population Production Error Report If RPTYPE = 02 or 03 and all PARMTR values are zero, then all reports of that RPTYPE will be produced.

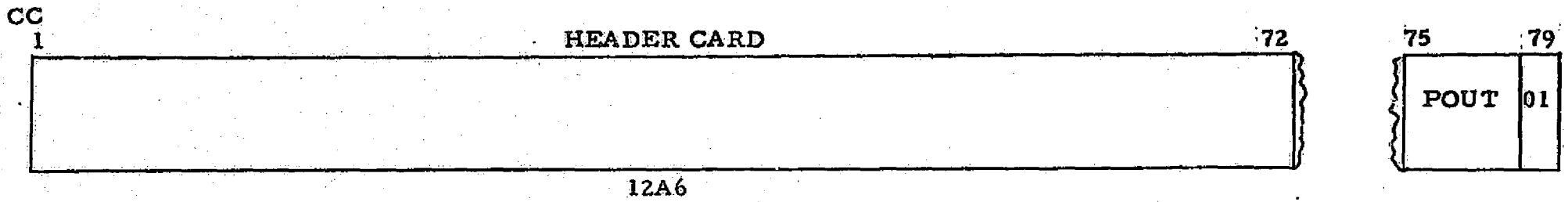
Table 3.8-1. POUT Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
CASIN	-	5	0	0-9999	-	Case number identification associated with the required input file. A case number must be input for every report produced. Relationship between RPTYPE, PARMTR and ICASIN follows. ICASIN(1) = case no. RPTYPE = 01 = 02 PARMTR(1)≠0 = 03 PARMTR(1)≠0 = 04 ICASIN(2) = case no. RPTYPE = 02 PARMTR(2)≠0 = 03 PARMTR(2)≠0 ICASIN(3) = case no. RPTYPE = 02 PARMTR(3)≠0 = 03 PARMTR(3)≠0 ICASIN(4) = case no. RPTYPE = 02 PARMTR(4)≠0 = 03 PARMTR(4)≠0 ICASIN(5) = case no. RPTYPE = 02 PARMTR(5)≠0 If all PARMTR values are zero for a RPTYPE = 02 or 03, then all the ICASIN values (case number) must be entered for that RPTYPE value.
LEVEL	-	1	1	0-3	-	Parameter report level indicator for RPTYPE = 2. =1 - reports produced at zone level; =2 - at region level; =3 - at country level.
ICSESH	-	1	0	0-9999	-	Case number identification for the SUBHST input file. Required only when RPTYPE = 2 and PARMTR = 1, 2 or 3.

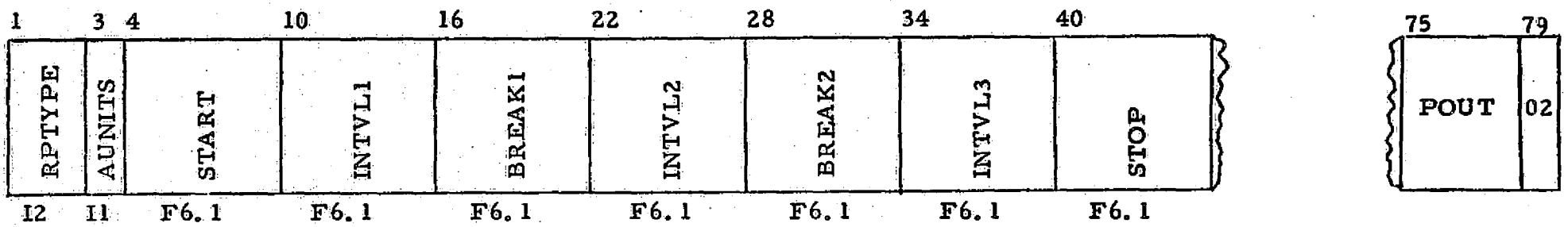
Table 3.8-1. POUT Input Data Description (cont'd)

Name	Symbol	Dimension	Nominal Value	Range	Units	Description
BIOWD	-	4	0	0, 1	-	Prediction bio-window flags: BIOWD(n) =1 to process bio-window n =0 otherwise for RPTYPE = 02 and PARMTR(2)≠0 Selects by bio-window in record. PARMTR(3)≠0 Uses last yield date in record. PARMTR(4)≠0 or PARMTR(5)≠0 Selects by bio-window in record. for RPTYPE = 03 Selects by bio-window in record.
WPRTY	-	4	0	0-4	-	Bio-window priorities: List of bio-windows in decreasing order of priority, e.g., 4, 1, 3, 2 or 3, 1, 0, 0. Used only by RPTYPE = 02 and PARMTR(2)≠0 in conjunction with the prediction dates below.
IPRD	-	3, 14	0	year: >64 month: 01-12 day: 01-31	-	Prediction dates (up to 14 dates) for the selection of data for RPTYPE = 02 or 03. IPRD(1, n) = year - 1900 IPRD(2, n) = month IPRD(3, n) = day The dates must be in ascending order. The first zero date terminates the list. For RPTYPE = 02 and PARMTR(2)≠0 Prediction date selected as a function of priority above and latest date less than or equal to the input prediction date. PARMTR(3)≠0 Selects the latest yield date less than or equal to the input prediction date. PARMTR(4) or (5)≠0 and all RPTYPE = 03 the input prediction dates must match with file dates; otherwise a message is printed and that date skipped.

Table 3.8-2. POUT Data Card Formats



DATA CARD 1



DATA CARD 2

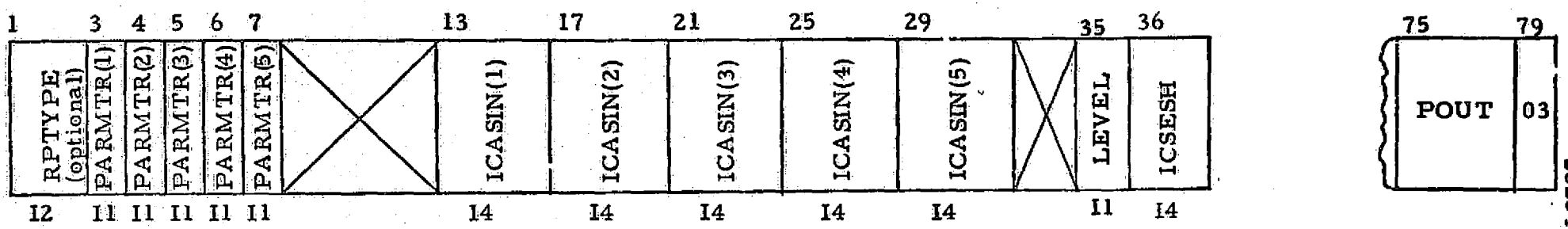
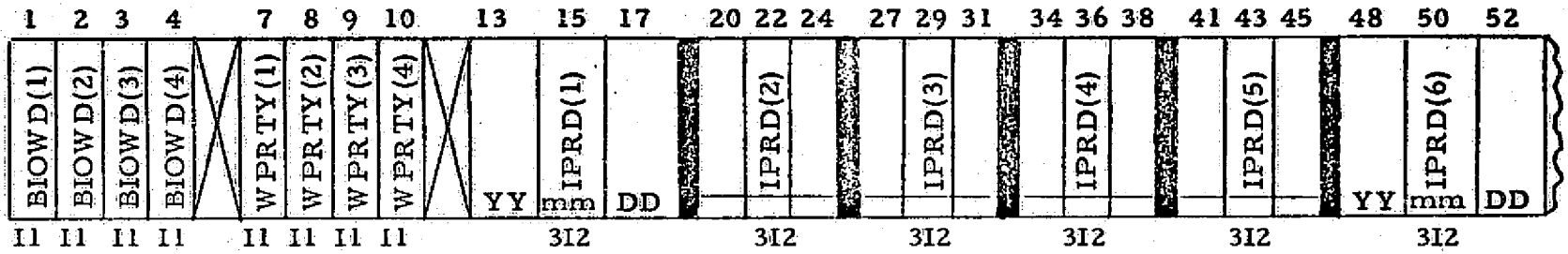
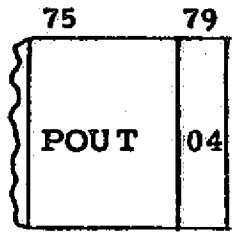


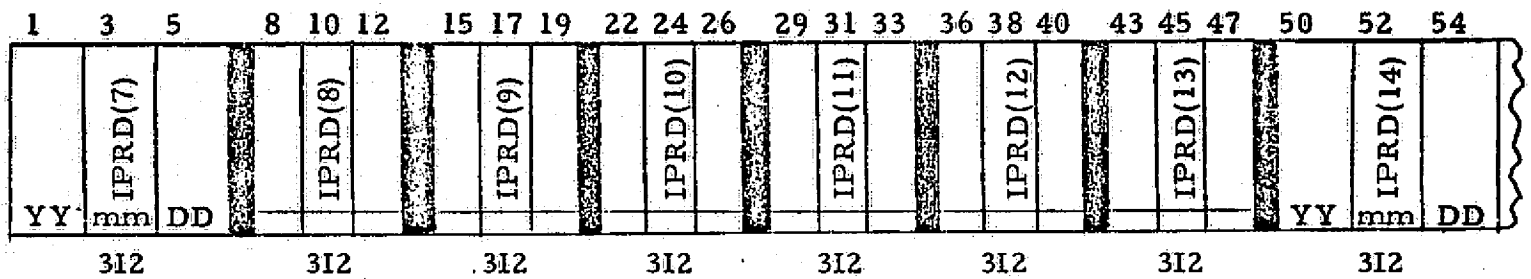
Table 3.8-2. POUT Data Card Formats (cont'd)

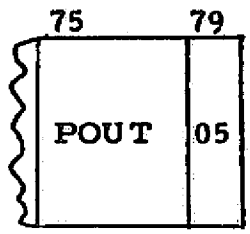
DATA CARD 3





DATA CARD 4





3.8.1.3 Deck Setup

1. Header Card - sequence 01
2. Data Card 1 - sequence 02
3. Data Card 2 - sequence 03
4. Data Card 3 - sequence 04
5. Data Card 4 - sequence 05

3.8.1.4 Rules for Entering Data on Cards

3.8.1.4.1 General

1. Integers must be entered right-justified.
2. Alphanumeric names must be entered left-justified.
3. F format numbers must have the decimal point present, i.e., F6.1 ±XXX.X
4. The card sequence numbers in CC. 79-80 must be present on all cards.

3.8.1.4.2 Specific Fields

The correspondence between the RPTYPE, PARMTR and ICASIN input values, and the required input files versus the produced reports is shown in Table 3.8-3 below.

Histogram ranges, PARMTR, BIOWD, WPRTY, IPRD input values are required only if RPTYPE=02 and =03. LEVEL is required only if RPTYPE=02.

Table 3.8-3. Input Flag Value Definitions

RPTYPE	PARMTR(I) where I =	ICASIN(I) where I =	Req. Input Files	Report
01	-	1	SUBHST	Substrata Reference Data
02	1*	1	SEGTRU	Population Sampling Error
	2*	2	CAMSF	Population CAMS Error
	3*	3	YESOUT	Population Yield Error
	4	4	CASF	Population Area Error
	5	5	CASF	Population Production Error
03	1	1	CASDIS	Monte Carlo Area Error
	2	2	CASDIS	Monte Carlo Production Error
	3	3	CASDIS	Monte Carlo Yield Error
	4	4	CASDIS	Confidence Level
04	-	1	ACQUIS	Frequency of Sample Segment Acquisition

*SUBHST file also required for each report.

3.8.2 Sample Card Inputs

Substrata Reference Data Report

```
TEST CASE 1 - RPTYPE=1, SUBSTRATA REFERENCE DATA REPORT (UNIVAC HAND OFF    LPP SIMULATION  PAGE   1

      RPTYPE   PARMT      ICASIN                                  LEVEL  ICSESH
        1      1 0 0 0 0      1    1   -0   -0   -0    1          1

INTERVAL  START  INTVL1  BREAK1  INTVL2  BREAK2  INTVL3    STOP
           -.0     -.0     -.0     -.0     -.0     -.0      -.0

      BIOWD    WPRTY
     -0-0-0-0  -0-0-0-0

      IPRD
     -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0
     -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0
```

Population Histogram Report

```
TEST CASE 2 - RPTYPE=2, PARMTR(3)=1 PARMTR(5)=1  YIELD AND PROD REPORTS    LPP SIMULATION  PAGE   1

      RPTYPE   PARMT      ICASIN                                  LEVEL  ICSESH
        2      0 0 1 0 1      1    1    1    1    1    1          1

INTERVAL  START  INTVL1  BREAK1  INTVL2  BREAK2  INTVL3    STOP
         -500.0   100.0  -100.0     5.0   100.0   100.0   500.0

      BIOWD    WPRTY
      1 1 1 0  3 1 2 0

      IPRD
      76 1 1 5  76 2 1   76 2 1 5  -0-0-0    -0-0-0    -0-0-0    -0-0-0
     -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0    -0-0-0
```

3.8.2 Sample Card Inputs (cont'd)

Monte Carlo Histogram Report

```
TEST CASE 3 - RPTYPE=3, PARMTR(1,3)=1          MONTE CARLO REPORTS          LPP SIMULATION  PAGE   1

 RPTYPE   PARMT      ICASTN                                  LEVEL  ICSESH
   3      1 0 1 0 0      1     1     1     1     1     1        1

INTERVAL  START   INTVL1   BREAK1   INTVL2   BREAK2   INTVL3     STOP
          -50.0    10.0    -10.0       .5    10.0     10.0      50.0

 BIOWD    WPRTY
 1 1 1 0  3 1 2 0

 IPRD
 76 115   76 2 1   76 215   -0-0-0   -0-0-0   -0-0-0   -0-0-0
 -0-0-0   -0-0-0   -0-0-0   -0-0-0   -0-0-0   -0-0-0   -0-0-0
```

Acquisition Data Report

```
TEST CASE 1 - RPTYPE=4 ACQUISTION DATA REPORT (UNIVAC HAND OFF)          LPP SIMULATION  PAGE   1

 RPTYPE    PARMT       ICASTN                                  LEVEL  ICSESH
   4     -0-0-0-0-0        1     -0    -0    -0    -0    -0       -0

INTERVAL  START   INTVL1   BREAK1   INTVL2   BREAK2   INTVL3     STOP
          -.0      -.0      -.0      -.0      -.0      -.0       -.0

 BIOWD    WPRTY
 -0-0-0-0 -0-0-0-0

 IPRD
 -0-0-0-0   -0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0
 -0-0-0-0   -0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0   -0-0-0-0
```

3.8.3 Output Report Data Definitions

See Table 3.8-4.

3.8.4 Sample Pages from Output Reports

1. See Figure 3.8-1 for Sample Substrata Reference Data Report.
2. See Figure 3.8-2 for Histogram Output Report. Note that all the five Population Reports and the four Monte Carlo Reports use this same format. Only the title changes.
3. See Figure 3.8-3 for Frequency of Sample Segment Acquisitions Report.

3.8.5 File Requirements

Input: All files are optional and files required are specified via the report options chosen.

SUBHST	-	Substrata Historical Data
SEGTRU	-	Segment Truth Data
CAMSF	-	CAMS Output File
YESOUT	-	YES Output File
CASF	-	CAS Output File
CASDIS	-	CAS Distribution File
ACQUIS	-	Acquisition Data File

Output: None

3.8.6 Error and Recovery

3.8.6.1 Input Errors

All input errors in this program will be fatal.

1. Label and sequence checking on control cards. Message

   *** IMPROPER LABEL AND SEQUENCE NUMBER ON POUT CONTROL CARD NO. ____. LABEL AND SEQ. NO. = ____.

2. Range testing on RPTYPE value. Message

   *** RPTYPE VALUE OUT OF RANGE. RPTYPE = _____.

Table 3.8-4. POUT Output Report Data Definitions

Report Name	Symbol	Range	Units	Report	Description
Country	-	-	-	1., 2., 3.	4 character country ID
Case Number	-	1 - 9999	-	1., 2., 3.	Case ID no.
Strata	-	1 - 9999	-	1., 2	Strata no. within zone
Zone	-	1 - 999	-	1., 2., 3.	Zone no. within region
Region	-	1 - 999	-	1., 2., 3.	Region no. within country
Hist WA	$\widetilde{WA}$	0 - 999999	10000 acres or 1000 Hectares	1.	Historical wheat area at various ID levels
True WA	WA	0 - 999999	10000 acres or 1000 Hectares	1.	True historical wheat area at various ID levels
No. in substrata group 1 2 3	-	-	-	1.	The number of substrata belonging to Group 1, 2, and 3, respectively
No. of segments of group 1 2 3	-	-	-	1.	The number of segments belonging to Group 1 and Group 2 substrata
Input bias % hist.	-	0 - 9999	%	1.	PCT deviation between the true WA and the historical value computed from input bias data
Simulation bias % hist.	-	0 - 9999	%	1.	PCT deviation between the true WA and the historical value used in the simulation
Input CV % true	-	0 - 9999	%	1.	Aggregated within county area std. deviation in PCT of true WA
Simulation CV % true	-	0 - 9999	%	1.	Std. deviation of difference between substrata true WA and historical WA in % of true area

Table 3.8-4. POUT Output Report Data Definitions (cont'd)

Report Name	Symbol	Range	Units	Report	Description
File name	-	-	-	2., 3.	Name of input file used to generate report
Parameter range	-	-999.9 → +999.9		2.	A table illustrating for any parameter the range of values that would have to appear in any 1 of 51 slots or buckets - histogram
Data type	-	-	-	2.	Name of the variable for which the histogram is being printed
Mean	-	-999.999 →999.999	-	2.	Mean value of the data readings of the variable under study
Std. deviation	-	-999.999 →999.999	-	2.	Standard deviation of the data readings of the variable under study
Ref. value	-	-	-	2.	Value used to normalize the range of the reported variable
Mean of population sum	-	0 - 100	-	2.	Expected value of the population sum
Std. deviation of population sum	-	0 - 100	-	2.	Standard deviation of population sum
Minimum reading	-	- 999.999 → 999.999	-	2.	Minimum data reading of variable
Maximum reading	-	- 999.999 → 999.999	-	2.	Maximum data reading of variable
No. of readings	-	0 - 9999	-	2.	No. of data readings of variable
Prediction date	-	-	-	2.	Month, day and year of prediction point
Histogram data	-	0 - 100	%	2.	No. of times that a data reading falls in a slot divided by the total no. of readings. 51 slots and cum percentage from the first bucket to the bucket of interest
No. of segments used	-	0 - 4000	-	3.	Total no. of segments that were tallied within an ID level
Bio window combinations (in percent)	-	0 - 100	%	3.	% of segments that have at least one acquired observation in a particular bio window combination

S U B S T R A T A R E F E R E N C E D A T A

COUNTRY USA CASE NUMBER 1

STRATA	AREA (THOUSAND HECTARES) HIST WA	TRUE WA	NO. IN SUBSTRATA GROUP 1	2	3	NO. OF SEGMENTS OF GROUP 1	2	INPUT BIAS FCT HIST	SIMULATION BIAS FCT HIST	INPUT CV2 FCT TRUE	SIMULATION LV1 FCT TRUE
20	404.7	419.1	0	5	0	0	0	.0500	.0357	.0449	.0420
50	161.9	165.1	2	0	0	2	0	.0500	.0202	.0707	.0099
70	80.9	100.3	1	0	0	2	0	.0500	.2386	.1000	.0000
90	485.6	542.7	0	1	5	0	0	.0500	.1175	.0409	.0268
ZONE 4	1133.1	1227.2	3	6	5	4	0	.0500	.0830	.0511	.0275
20	80.9	73.0	0	0	1	0	0	.0500	-.0975	.1000	.0000
50	80.9	96.0	0	0	1	0	0	.0500	.1866	.1000	.0000
80	80.9	88.8	0	0	1	0	0	.0500	.0976	.1000	.0000
ZONE 10	242.8	257.9	0	0	3	0	0	.0500	.0622	.1000	.0000
10	809.4	836.0	1	6	3	1	2	.0500	.0329	.0317	.0291
20	728.4	763.3	9	0	0	18	0	.0500	.0479	.0337	.0510
30	647.5	703.2	8	0	0	16	0	.0500	.0860	.0354	.0257
50	809.4	877.8	4	6	0	6	1	.0500	.0845	.0317	.0169
70	404.7	422.3	3	1	1	3	0	.0500	.0434	.0449	.0471
80	566.6	597.4	5	2	0	6	0	.0500	-.0338	.0378	.0217
90	566.6	596.6	7	0	0	7	0	.0500	.0530	.0379	.0326

Figure 3.8-1. Sample Substrata Reference Data Report

TEST CASE 1 - RPTYPE=1, SUBSTRATA REFERENCE DATA REPORT (UNIVAC HAND OFF LPP SIMULATION PAGE 3

S U B S T R A T A R E F E R E N C E D A T A

COUNTRY USA CASE NUMBER 1

A R E A
(THOUSAND HECTARES)

STRATA	HIST HA	TRUE HA	NO. IN SUBSTRATA GROUP 1	2	3	NO. OF SEGMENTS OF GROUP 1	2	INPUT BIAS FCT HIST	SIMULATION BIAS FCT HIST	INPUT CV2 FCT TRUE	SIMULATION CV1 FCT TRUE
ZONE											
30	4532.5	4746.5	37	15	4	57	3	.0500	.0472	.0352	.0311
REG											
1	5908.4	6231.7	40	21	12	61	3	.0500	.0547	.0410	.0291
COUN											
USA	5908.4	6231.7	40	21	12	61	3	.0500	.0547	.0410	.0291

Figure 3.8-1. Sample Substrata Reference Data Report (cont'd)

POPULATION YIELD ERROR

CASE NUMBER 1

FILE NAME YES

RANGE OF YIELD ERROR	R								
	1	LESS THAN -500.000	18	-40.000	TO -35.000	35	40.000	TO	45.000
	2	-500.000 TO -400.000	19	-35.000	TO -30.000	36	45.000	TO	50.000
	3	-400.000 TO -300.000	20	-30.000	TO -25.000	37	50.000	TO	55.000
	4	-300.000 TO -200.000	21	-25.000	TO -20.000	38	55.000	TO	60.000
	5	-200.000 TO -100.000	22	-20.000	TO -15.000	39	60.000	TO	65.000
	6	-100.000 TO -95.000	23	-15.000	TO -10.000	40	65.000	TO	70.000
	7	-95.000 TO -90.000	24	-10.000	TO -5.000	41	70.000	TO	75.000
	8	-90.000 TO -85.000	25	-5.000	TO .000	42	75.000	TO	80.000
	9	-85.000 TO -80.000	26	.000	TO -.000	43	80.000	TO	85.000
	10	-80.000 TO -75.000	27	-.000	TO 5.000	44	85.000	TO	90.000
	11	-75.000 TO -70.000	28	5.000	TO 10.000	45	90.000	TO	95.000
	12	-70.000 TO -65.000	29	10.000	TO 15.000	46	95.000	TO	100.000
	13	-65.000 TO -60.000	30	15.000	TO 20.000	47	100.000	TO	200.000
	14	-60.000 TO -55.000	31	20.000	TO 25.000	48	200.000	TO	300.000
	15	-55.000 TO -50.000	32	25.000	TO 30.000	49	300.000	TO	400.000
	16	-50.000 TO -45.000	33	30.000	TO 35.000	50	400.000	TO	500.000
	17	-45.000 TO -40.000	34	35.000	TO 40.000	51	GR. THAN		500.000

DATA TYPE POPULATION MEAN -1.395 (PCT) STD. DEVIATION 1.576 (PCT) REF. VALUE 874.063 10**3 METRIC TONS

MEAN OF POPULATION SUM -5.578 (PCT) STD. DEVIATION OF POPULATION SUM 3.153 (PCT)

MINIMUM READING -3.758 (PCT) MAXIMUM READING -.540 (PCT) NUMBER OF READINGS 4

COUNTRY USA REGION 1 ZONE 4 BIO-WINDOW NUMBER 1

Figure 3.8-2. Histogram Output Report

TEST CASE 2 - RPTYPE=2, PARMTR(3)=1 PARMTR(5)=1 YIELD AND PROD REPORTS LPP SIMULATION PAGE 3

HISTOGRAM DATA								
1.	.000	.000	18.	.000	.000	35.	.000	100.000
2.	.000	.000	19.	.000	.000	36.	.000	100.000
3.	.000	.000	20.	.000	.000	37.	.000	100.000
4.	.000	.000	21.	.000	.000	38.	.000	100.000
5.	.000	.000	22.	.000	.000	39.	.000	100.000
6.	.000	.000	23.	.000	.000	40.	.000	100.000
7.	.000	.000	24.	.000	.000	41.	.000	100.000
8.	.000	.000	25.	100.000	100.000	42.	.000	100.000
9.	.000	.000	26.	.000	100.000	43.	.000	100.000
10.	.000	.000	27.	.000	100.000	44.	.000	100.000
11.	.000	.000	28.	.000	100.000	45.	.000	100.000
12.	.000	.000	29.	.000	100.000	46.	.000	100.000
13.	.000	.000	30.	.000	100.000	47.	.000	100.000
14.	.000	.000	31.	.000	100.000	48.	.000	100.000
15.	.000	.000	32.	.000	100.000	49.	.000	100.000
16.	.000	.000	33.	.000	100.000	50.	.000	100.000
17.	.000	.000	34.	.000	100.000	51.	.000	100.000

DATA TYPE POPULATION MEAN -1.395 (PCT) STD. DEVIATION 1.576 (PCT) REF. VALUE 874.063 10**3 METRIC TONS

MEAN OF POPULATION SUM -5.578 (PCT) STD. DEVIATION OF POPULATION SUM 3.155 (PCT)

MINIMUM READING -3.758 (PCT) MAXIMUM READING -.540 (PCT) NUMBER OF READINGS 4

COUNTRY USA REGION 1 ZONE 4 BID-WINDOW NUMBER 1

Figure 3.8-2. Histogram Output Report (cont'd)

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

TEST CASE 2 - RPTYPE=2, PARMTR(3)=1 PARMTR(5)=1 YIELD AND PROD REPORTS LPP SIMULATION PAGE 21

POPULATION PRODUCTION ERROR

CASE NUMBER 1

FILE NAME CASCUM

HISTOGRAM DATA								
1.	.000	.000	18.	.000	.000	35.	.000	100.000
2.	.000	.000	19.	.000	.000	36.	.000	100.000
3.	.000	.000	20.	.000	.000	37.	.000	100.000
4.	.000	.000	21.	.000	.000	38.	.000	100.000
5.	.000	.000	22.	.000	.000	39.	.000	100.000
6.	.000	.000	23.	.000	.000	40.	.000	100.000
7.	.000	.000	24.	25.000	25.000	41.	.000	100.000
8.	.000	.000	25.	25.000	50.000	42.	.000	100.000
9.	.000	.000	26.	.000	50.000	43.	.000	100.000
10.	.000	.000	27.	50.000	100.000	44.	.000	100.000
11.	.000	.000	28.	.000	100.000	45.	.000	100.000
12.	.000	.000	29.	.000	100.000	46.	.000	100.000
13.	.000	.000	30.	.000	100.000	47.	.000	100.000
14.	.000	.000	31.	.000	100.000	48.	.000	100.000
15.	.000	.000	32.	.000	100.000	49.	.000	100.000
16.	.000	.000	33.	.000	100.000	50.	.000	100.000
17.	.000	.000	34.	.000	100.000	51.	.000	100.000

DATA TYPE POPULATION MEAN -1.582 (PCT) STD. DEVIATION 2.080 (PCT) REF. VALUE 874.063 10**3 METRIC TONS

MEAN OF POPULATION SUM -6.326 (PCT) STD. DEVIATION OF POPULATION SUM 5.360 (PCT)

MINIMUM READING -5.366 (PCT) MAXIMUM READING .562 (PCT) NUMBER OF READINGS 4

COUNTRY USA REGION 1 ZONE 4 BIO-WINDOW NUMBER 1

Figure 3.8-2. Histogram Output Report (cont'd)

TEST CASE 3 - RPTYPE=3, PARMTR(1,3)=1 MONTE CARLO REPORTS LPP SIMULATION PAGE 2

MONTE CARLO AREA ERROR

CASE NUMBER 1

FILE NAME CASDIS

RANGE OF AREA ERROR	#		#		#	
	1	LESS THAN -50.000	18	-4.000 TO -3.500	35	4.000 TO 4.500
	2	-50.000 TO -40.000	19	-3.500 TO -3.000	36	4.500 TO 5.000
	3	-40.000 TO -30.000	20	-3.000 TO -2.500	37	5.000 TO 5.500
	4	-30.000 TO -20.000	21	-2.500 TO -2.000	38	5.500 TO 6.000
	5	-20.000 TO -10.000	22	-2.000 TO -1.500	39	6.000 TO 6.500
	6	-10.000 TO -9.500	23	-1.500 TO -1.000	40	6.500 TO 7.000
	7	-9.500 TO -9.000	24	-1.000 TO -.500	41	7.000 TO 7.500
	8	-9.000 TO -8.500	25	-.500 TO .000	42	7.500 TO 8.000
	9	-8.500 TO -8.000	26	.000 TO -.000	43	8.000 TO 8.500
	10	-8.000 TO -7.500	27	-.000 TO .500	44	8.500 TO 9.000
	11	-7.500 TO -7.000	28	.500 TO 1.000	45	9.000 TO 9.500
	12	-7.000 TO -6.500	29	1.000 TO 1.500	46	9.500 TO 10.000
	13	-6.500 TO -6.000	30	1.500 TO 2.000	47	10.000 TO 20.000
	14	-6.000 TO -5.500	31	2.000 TO 2.500	48	20.000 TO 30.000
	15	-5.500 TO -5.000	32	2.500 TO 3.000	49	30.000 TO 40.000
	16	-5.000 TO -4.500	33	3.000 TO 3.500	50	40.000 TO 50.000
	17	-4.500 TO -4.000	34	3.500 TO 4.000	51	GR. THAN 50.000

DATA TYPE MONTE CARLO MEAN -6.152 (PCT) STD. DEVIATION 9.159 (PCT) REF. VALUE 6231.662 10**3 HECTARES

MINIMUM READING -19.854 (PCT) MAXIMUM READING -.922 (PCT) NUMBER OF READINGS 4

COUNTRY USA *** COUNTRY DATA *** BIO-WINDOW NUMBER 1

Figure 3.8-2. Histogram Output Report (cont'd)

TEST CASE 3 - RPTYPE=3, PARMTR(1,3)=1 MONTE CARLO REPORTS LPP SIMULATION PAGE 3

HISTOGRAM DATA

1.	.000	.000	18.	.000	25.000	35.	.000	100.000
2.	.000	.000	19.	.000	25.000	36.	.000	100.000
3.	.000	.000	20.	.000	25.000	37.	.000	100.000
4.	.000	.000	21.	25.000	50.000	38.	.000	100.000
5.	25.000	25.000	22.	.000	50.000	39.	.000	100.000
6.	.000	25.000	23.	25.000	75.000	40.	.000	100.000
7.	.000	25.000	24.	25.000	100.000	41.	.000	100.000
8.	.000	25.000	25.	.000	100.000	42.	.000	100.000
9.	.000	25.000	26.	.000	100.000	43.	.000	100.000
10.	.000	25.000	27.	.000	100.000	44.	.000	100.000
11.	.000	25.000	28.	.000	100.000	45.	.000	100.000
12.	.000	25.000	29.	.000	100.000	46.	.000	100.000
13.	.000	25.000	30.	.000	100.000	47.	.000	100.000
14.	.000	25.000	31.	.000	100.000	48.	.000	100.000
15.	.000	25.000	32.	.000	100.000	49.	.000	100.000
16.	.000	25.000	33.	.000	100.000	50.	.000	100.000
17.	.000	25.000	34.	.000	100.000	51.	.000	100.000

DATA TYPE MONTE CARLO MEAN =6.152 (PCT) STD. DEVIATION 9.159 (PCT) REF. VALUE 6231.662 10**3 HECTARES

MINIMUM READING =19.854 (PCT) MAXIMUM READING =.922 (PCT) NUMBER OF READINGS 4

COUNTRY USA *** COUNTRY DATA *** BIO-WINDOW NUMBER 1

Figure 3.8-2. Histogram Output Report (cont'd)

TEST CASE 1 - RPTYPE=4 ACQUISITION DATA REPORT (UNIVAC HAND OFF) LPP SIMULATION PAGE 2

F R E Q U E N C Y O F S A M P L E S E G M E N T A C Q U I S I T I O N S

CASE NUMBER 1 FILE NAME ACQUISI

	NO. OF SEGMENTS USED	BIO-WINDOW COMBINATIONS (IN PERCENT) 0	1	2	3	4	1-2	1-3	1-4	2-3	2-4	3-4	1-2-3	1-2-4	1-3-4	2-3-4	1-2-3-4
ZONE 4	4	.00	.00	25.00	.00	.00	50.00	.00	.00	25.00	.00	.00	.00	.00	.00	.00	.00
ZONE 30	60	31.67	35.00	6.67	.00	.00	25.00	.00	.00	1.67	.00	.00	.00	.00	.00	.00	.00
REG 1	64	29.69	32.81	7.81	.00	.00	26.56	.00	.00	3.13	.00	.00	.00	.00	.00	.00	.00
COUN USA	64	29.69	32.81	7.81	.00	.00	26.56	.00	.00	3.13	.00	.00	.00	.00	.00	.00	.00

Figure 3.8-3. Frequency of Sample Segment Acquisitions Report

3. Range testing on Histogram interval values. Messages

*** START VALUE GREATER THAN BREAK1 VALUE.
START = _____ BREAK1 = _____.

*** BREAK1 VALUE GREATER THAN BREAK2 VALUE.
BREAK1 = _____ BREAK2 = _____.

*** BREAK2 VALUE GREATER THAN STOP VALUE.
BREAK2 = _____ STOP = _____.

*** THE SEGMENT BETWEEN START AND BREAK1 WILL NOT DIVIDE INTO EQUAL INTVL1 INTERVALS.
BREAK1 - START = _____. INTVL1 = _____.

*** THE SEGMENT BETWEEN BREAK1 AND BREAK2 WILL NOT DIVIDE INTO EQUAL INTVL2 INTERVALS.
BREAK2 - BREAK1 = _____. INTVL2 = _____.

*** THE SEGMENT BETWEEN BREAK2 AND STOP WILL NOT DIVIDE INTO EQUAL INTVL3 INTERVALS
STOP - BREAK2 = _____. INTVL3 = _____.

*** REQUESTED NO. OF HISTOGRAM INTERVALS EXCEEDS MAXIMUM OF 51.
REQUESTED NO. OF INTERVALS THAT WOULD BE GENERATED = _____.

4. Case number value missing from input. Message

*** ICASIN(i) VALUE MISSING FOR REPORT TYPE.
ICASIN(i) = _____ RPTYPE = _____ PARMTR(i) = _____.

3.8.6.2 Processing Errors

1. *** INPUT PREDICTION DATE DOES NOT MATCH DATE ON FILE.
RPTYPE = ____. PARMTR(i) = ____. INPUT DATE = ____.

Message in non-fatal. The input date is skipped.

2. Case number on control card does not match case number on file. Message

*** ICASIN(i) DOES NOT MATCH CASE NUMBER ON FILE.
ICASIN(i) = ____ FILE CASE NO. = ____ FILE NAME = ____.

The report associated with the missing file is skipped and the next report tried.

4.0 NOTES ON PROGRAM USE

4.1 GENERAL

EPHEMS will only have to be run about once a year once a particular orbit has been modeled correctly.

The utility, GRID, to generate the INDEX matrix should only need to be run once.

SEE will require rerunning any time an error model will change. It would be expected, however, that it would be desirable to have several different sets of models available. Consequently, a group of runs may be needed but once these runs are completed, another run should not be needed for a long time. Since the files generated by SEE are small, it may be desirable to keep them on disk as cataloged files.

LUMP will have to be run for each country and each time the data base is changed. The three output files from each LUMP run will have to be kept on tape.

SAGE will only be run normally when LUMP has been run so that the SEGREF file should be kept on tape. Since this is the only use of SWATH and SWATHR files, they should be kept on tape also.

SACS can be run quite frequently if it is desired to change the conditions of segment access. SACS is a fast running program and the ACQUIS file is small compared to SEGREF. Whether to rerun SACS or try to use an existing ACQUIS file from a library depends on how many files have to be saved and accounted for.

LEM is the main LACIE simulation application program. Thus it will receive the most usage. If Monte Carlo iterations are not being used, the runs will be reasonably fast and inexpensive. Additional time can be saved, if desired, by using saved SEGTRU, CAMSF and YESOUT files where possible. When running in this mode, consideration must be given to the number of saved tape files that can accumulate vs. the run time required to regenerate the files. CASF and CASDIS are the only required output files. The program will run very slow if all subprograms are executed for more than just a few iterations.

POUT will usually be run when more detailed statistical analysis is required of LEM output data. This program generates no output files and, for any one output report, will run fast.

4.2 RESTART

No provision for restarting any program in the middle of a run due to an error has been made. The frequency of use and the run times of all programs except for LEM make this feature unnecessary. Restart is provided in LEM between each Monte Carlo iteration. However, the way the program is implemented, restart can be used only in the non-error mode. If EXEC VIII as used at NASA has a user error wrapup exit, then the wrapup code from LEM could be duplicated in an error routine. If this routine is called in case of a processing fatal error, then the last random number seed could be printed and the CASDIS and CASF files can be closed.

It should be noted that since extensive input data error checking is performed at the beginning of all programs, the only job terminating error that is apt to occur is a system/hardware error.

Note: On restart it is necessary to input the final active random number seeds (RSEED(i)) which are printed out at the end of the previous LEM run. Care must also be taken to enter the appropriate values of RSTART and NTRIAL. For example, if a restart is desired after five trials to continue for another five trials

RSTART = 5 (number of previous interations)
NTRIALS = 10 (total number of iterations)

4.3 USAGE OF LEM

The LEM program contains the Segment Truth Generator, CAMS, YES, and CAS subprograms, and provides the Monte Carlo control for the execution of these modules. The LEM control coupled with the CAMS options allow the user to taylor error model configurations to his specific needs. The options available to the user have been previously defined. This section will illustrate the use of these options to construct meaningful cases by use of specific examples.

Figure 4.3-1 shows the LEM control data flag set up for ten specific cases running from no errors to all error sources with various combinations. These are but a few of the possible configurations that the user may construct. Case 1 gives the sample error omitting within county variance or cloud cover effects. Cases 2 and 3 add cloud cover effects and within county variance, respectively. Cases 4 and 5 examine YES and CAMS errors, respectively. Note that there are three different CAMS errors that may be controlled separately or in combination with each other. In addition to this control, the specific form of the errors can be controlled by the CAMS input options. Case 7 examines the effect of varying the multi-year historical statistics used for CAS aggregation over a number of iterations (>1). Cases 8 and 9 give examples of holding data constant from previous iterations (1^{st}) or from previously generated files. The errors or combination of errors so treated may be varied in accordance with the user's desires. In the latter case, care must be taken to mount the proper files to be used. Case 10 is a Monte Carlo case. This example shows only the classification error varying; however, any error or combination of errors may be varied. The restart option allows the user to run a subset of the Monte Carlo trials, examine the results, and continue with the run at a later time.

The CAMS subprogram provides options for different classification models, signature extension models and the use of multi-temporal sampling. The classification model flag, IMODEL, may be set to:

$$\text{IMODEL} \begin{cases} = 1 & - \text{ complex omission/commission model} \\ = 2 & - \text{ simple error model} \end{cases}$$

Care must be taken to insure that the proper error data is defined in SEE for the model chosen. The signature extension model for ordinary segments includes additive and multiplicative bias and random errors. The option of selecting the additive or multiplicative case for the random component can be exercised by setting:

$$\text{ISIGEX} \begin{cases} = 0 & - \text{ additive random component} \\ \neq 0 & - \text{ multiplicative component} \end{cases}$$

CASE DESCRIPTION	LEM CONTROL DATA									
	NTRIALS	ICAMS	ISEXT	ISCC	ICLASS	ISTG	IYES	ICAS2	ICAS3	IACQ
1. No errors, no acq. data (sample error)	1	3	-	-	-	3	3	1	1	1
2. No errors, use acq. data (cloud cover effects)	1	3	-	-	-	3	3	1	1	0
3. Segment truth variation (within county variance)	1	0	2	2	2	0	3	1	1	0
4. YES error only	1	3	-	-	-	3	0	1	1	0
5. CAMS errors only	1	0	0	0	0	3	3	1	1	0
6. All error sources	1	0	0	0	0	0	0	1	1	0
7. Vary CAS multi-year effect	>1	any configuration						0	0	0
8. Hold 1st iteration CAMS error constant and vary YES error	>1	1	1	1	1	1	0	1	1	0
9. Read CAMS errors from existing file and vary YES error	>1	2	-	-	-	3	0	1	1	0
10. Monte Carlo classification error	>1	0	2	2	0	1	1	1	1	0

Figure 4.3-1. LEM Control Data Examples

The multi-temporal sampling effect is provided to simulate the effect of segment acquisitions in more than one window. The simulation is accomplished by multiplying the error of the present window by a factor which depends on the previous windows acquired. The option for using this feature may be exercised by setting:

IMULTI { = 0 - include multi-temporal sampling effect
≠ 0 - bypass multi-temporal sampling effect

4.4 USAGE OF POUT

The preparation of control data to create the substrata reference data report or the frequency of sample segment acquisition report is straightforward and will not be discussed here. See Sections 3.8.1 and 3.8.2 for details. The preparation of control data for the population and Monte Carlo reports is more complicated and examples are discussed below.

4.4.1 Population Report Example

Assume that the population CAMS error report and the population area report is to be generated. English units are to be used. Two intervals are to be used for the histograms, 10 between 0 and 200 and 25 between 200 and 475. The reports are to be produced at the region level. Besides the three bio-windows, there are four prediction dates. The files SUBHST, CAMSF and CASF must be mounted. The data inputs would be as follows:

RPTYPE = 2
AUNITS = 0
START = 0
INTVL1 = 10
BREAK1 = 200
INTVL2 = 25
BREAK2 = 475
} Do not enter data for INTVL3 or STOP in this case
PARMTR(2) = 3, PARAMTR(4) = 6
ICASIN(2) = 1001, ICASIN(4) = 2005
LEVEL = 2
BIOWD(1) = 1, BIOWD(2) = 4, BIOWD(4) = 2
WPRTY(1) = 2, WPRTY(2) = 4, WPRTY(3) = 1
IPRD(1,1) = 71,7,20, IPRD(1,2) = 71,9,15, IPRD(1,3) = 71,11,21,
IPRD(1,4) = 72,2,1

4.4.2 Monte Carlo Report Option

Assume that the Monte Carlo production error report is to be produced. Metric units are to be used. The nominal irterval and start and stop values are to be used for the histograms. The report is to be produced at the zone level. Two bio-windows are to be used and two prediction points. The only file required is the CASDIS file. The control card data would be as follows:

RPTYPE = 4
AUNITS = 2
PARMTR(2) = 7
ICASIN(2) = 7021
BIOWD(1) = 5, BIOWD(2) = 1
IPRD(1, 1) = 74, 4, 17, IPRD(1, 2) = 74, 7, 1